Agricultural Business and Finance

Primary Career Cluster:	Agriculture, Food and Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5943
Prerequisite(s):	*Organizational Leadership and Communications* (5956)
Credit:	1
Grade Level:	12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses. In addition, this course satisfies the *Personal Finance* requirement for graduation.
Programs of Study and Sequence:	This is the fourth and final course in the *Agribusiness* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Stena.Meadows@tn.gov Vacant, Middle Tennessee FFA Consultant Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	OSHA 30-Hour General Industry
Dual Credit or Dual Enrollment Opportunities:	A statewide dual credit challenge examination exists for this course for students to earn dual credit at Tennessee public postsecondary institutions that offer agriculture. For more information, please visit https://www.tn.gov/content/tn/education/early-postsecondary.html.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	Teachers shall attend the state approved training to teach personal finance for this course to satisfy the personal finance requirement.
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html

Course Description

Agricultural Business and Finance is an applied course that addresses the economic and business principles necessary to operate a successful agribusiness. The course covers a wide range of topics in

business, finance, economics, and management. Upon completion of this course, proficient students will have learned to apply the principles drawn from these topics toward activities that support their own business aspirations in the agriculture industry. *Agricultural Business and Finance* is a dual credit course with statewide articulation.

Program of Study Application

This is the fourth and final course in the *Agribusiness* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food and Natural Resources website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

History and Evolution of Agribusiness

1. Explore the evolution of agribusiness in the United States by describing the modern agribusiness sectors and identifying historical milestones impacting their development. Using local job postings and labor and workforce data, research occupations in agribusiness and management, and identify the knowledge, skills, and abilities necessary for employment.

2. Write an informative essay that compares and contrasts different business and ownership models of agribusinesses (such as proprietorships, partnerships, corporations, limited liability companies, franchises, and cooperatives). Include the scope, economic impact, and future trends of a specific type of agribusiness locally, regionally, nationally, and globally, citing specific evidence from news articles or government publications.

3. Demonstrate the ability to prepare basic personal and business records to complete taxes, employment and SAE related applications, including resume, budgets, income statements, balance sheets, cash flow statements, profit and loss statements, and equity statements.

Saving, Investing, and Financing

4. Examine different forms of saving, investing, and financing by researching available financial services at banks, credit unions, and savings and loans. Justify a selected financial service option for a specific personal and/or agribusiness use by developing a claim and supporting it with reasoning and evidence pulled from the financial institution.)

5. Demonstrate the accurate analysis of financial data by maintaining balanced records for all accounts within a variety of diversified agricultural enterprises or supervised agricultural experience programs (SAE) by preforming the following processes:
    a. Recording and posting entries to affected supplies, inventory, notes receivable, insurance, accounts payable, and taxes.
    b. Preparing profit and loss statement for a specific enterprise (plant, animal, or service).
    c. Record closing entries of temporary accounts including revenue, operation expense, non-cash expenses, closing inventory, non-current inventory, etc.

d. Prepare end of the year closing reports to project profit, and documentation to secure loans or investors.

For this example, the sources of the documents and financial statements can be from the prior fiscal or tax year

6. Using visual representations and mathematical equations, compare and contrast the differences between personal, business, and farm financing, including but not limited to sources, terms, and available risk management strategies (such as insurance, investments, and commodity trading). Using quantitative reasoning and appropriate units, calculate simple and compound interest for a given financing option.

Recordkeeping and Accounting

7. Articulate the components of a business plan, and research exemplars from national or local companies. Demonstrate the ability to prepare basic personal and business records, including budgets, income statements, balance sheets, cash flow statements, profit and loss statements, and equity statements.

8. Differentiate between bookkeeping and accounting. Justify the need for organized recordkeeping processes as an integral part of a comprehensive management system.

9. Apply fundamental principles of financial recordkeeping to agribusiness planning, logistics, and operations, including at a minimum the following:
    a. Differentiating between fixed and variable costs
    b. Determining pricing methods
    c. Using general ledger and basic accounting principles (accrual vs. cash basis)
    d. Calculating depreciation, current and not current inventory values, and change in total net worth
    e. Estimating simple and compound interest

10. Consult technical texts to research and generate connections regarding the relationships between depreciation, taxation, and insurance.

Consumer Finance

11. Craft an argumentative essay that makes a claim about the importance of a specific responsible personal finance practice in agribusiness. Develop claim(s) and counterclaim(s) fairly with reasoning and evidence about the factors impacting credit and income. Include basic financial management and financial security tips.

12. Examine essential principles of consumer finance by summarizing common banking procedures and services, including establishment of personal and operating accounts. Compare and contrast costs and benefits of financial services based on personal characteristics, wealth, debt, and risk management.

Economics of Agribusiness

13. Explain how economic principles apply to agribusiness, including macro versus micro systems, factors and effects of competition, inflation, pricing, and supply and demand relationships.

14. Analyze the role of government in setting monetary, fiscal, and taxation policies that affect the operations of agriculture businesses, including the sale of farm commodities. Investigate specific crops and discuss how economic policies set by the government impact the pricing and sale of a commodity, citing evidence from legislation and news articles. Determine the impact such policies have on consumers and producers.

15. Assess the global impact of American commodities on world food markets. Select a commodity produced in America and research foreign trade laws governing its sale. Make a claim about how these laws affect supply and demand in world economies, developing claim(s) and counterclaim(s) with reasoning and evidence from governmental agencies, non-profits, and news articles.

Business Planning and Management

16. Assess the importance of entrepreneurship in society. Differentiate between characteristics of successful and unsuccessful entrepreneurial endeavors. Evaluate methods for identifying opportunities in entrepreneurship and outline the major steps in starting an agribusiness.

17. Develop and present a comprehensive business plan for an agriculture-related business. Address at minimum the following components: type of agricultural ventures, projected profits, expenses, margins, returns on investment, and facilities and equipment needs.

18. Analyze case studies to illuminate the specific challenges of running an agriculture-related business. Determine the role that effective managerial skills play in an agribusiness venture to hypothesize the appropriate managerial skills for a variety of operational issues.

19. Summarize the history of agriculture-related policy development at the state and national levels. Research and identify major regulatory agencies and outline the principle policies governing modern agribusinesses, citing evidence from specific legislation. Compose an argumentative essay to make a claim supporting or opposing a specific government regulation in agriculture.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards ABS and CS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning

Approved April 10, 2015; Amended April 15, 2016

- Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Agriscience

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5957
Prerequisite(s):	*None*
Credit:	1
Grade Level:	9
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture, Food, & Natural Resources courses. In addition, this course satisfies one credit of laboratory science required for graduation.
Programs of Study and Sequence:	This is the first course in the *Agribusiness, Agricultural Engineering and Applied Technologies, Environmental and Natural Resources, Food Science, Horticulture Science,* and *Veterinary and Animal Science* programs of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Stena.Meadows@tn.gov Vacant, Middle Tennessee FFA Consultant Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture, Food, & Natural Resources students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	OSHA 10-Hour General Industry
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	(048 and 015), (048 and 016), (048 and 017), (048 and 081), (048 and 126), (048 and 127), (048 and 128), (048 and 129), (048 and 151), (048 and 211), (048 and 212), (048 and 213), (048 and 214), (048 and 414), (048 and 415), (048 and 416), (048 and 417), (048 and 418), (048 and 449), (150 and 015), (150 and 016), (150 and 017), (150 and 081), (150 and 126), (150 and 127), (150 and 128), (150 and 129), (150 and 151), (150 and 211), (150 and 212), (150 and 213), (150 and 214), (150 and 414), (150 and 415), (150 and 416), (150 and 417), (150 and 418), (150 and 449), (448 and 015), (448 and 016), (448 and 017), (448 and 081), (448 and 126), (448 and 127), (448 and 128),

	(448 and 129), (448 and 151), (448 and 211), (448 and 212), (448 and 213), (448 and 214), (448 and 414), (448 and 415), (448 and 416), (448 and 417), (448 and 418), (448 and 449)
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Description

Agriscience is an introductory laboratory science course that prepares students for biology, subsequent science and agriculture courses, and postsecondary study. This course helps students understand the important role that agricultural science and technology plays in the twenty-first century. In addition, it serves as the first course for all programs of study in the Agriculture, Food, & Natural Resources cluster. Upon completion of this course, proficient students will be prepared for success in more advanced agriculture and science coursework. This course counts as a lab science credit toward graduation requirements.

Program of Study Application

This course is the foundational course for all Agriculture, Food, & Natural Resources programs of study. For more information on the benefits and requirements of implementing these programs in full, please visit the Agriculture, Food, & Natural Resources website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

Agriscience Investigation and Overview

1) Synthesize research on the historical importance and purpose of agriculture and agriculture organizations, identifying major events, opportunities and technological developments influenced by agriscience theories and practices.

2) Identify and review general common laboratory safety procedures including but not limited to prevention and control procedures in agriscience laboratories. Incorporate safety procedures and complete safety test with 100 percent accuracy.

Agriculture and Society

3) Gather and analyze information from multiple authoritative sources, such as the United States Bureau of Labor Statistics, United States Department of Agriculture website and Tennessee labor data, to summarize the economic impact of the agricultural industry. Describe major career trends in Tennessee, the United States, and worldwide.

4) Determine how a Supervised Agricultural Experience (SAE) program functions as a method to apply concepts of the scientific investigation process (i.e. conducting an Agriscience Fair

project). Compare and contrast the types of SAEs as related to their importance to the scientific investigation process.

5) Conduct a research project or literature review exploring a specific social and/or political impact on the agriculture industry at the local, state, national, or international level. For example, explore how the increase in availability of genetically modified organisms has impacted crop production and the green movement. Summarize findings in an informative essay. Revise, edit or rewrite as needed to strengthen writing.

Fundamentals of Environmental Systems

6) Describe the biogeochemical cycles impacting the agriculture industry by creating illustrative models and informative texts for the following:
    a. Carbon cycle
    b. Nitrogen cycle
    c. Oxygen cycle
    d. Water cycle

7) Critique the dynamics of biomass and energy flow in ecosystems by analyzing the major components of a food chain. Analyze the structure of the relationships among the concepts of carrying capacity, species populations, and organism interactions within multiple ecosystems and natural habitats.

8) Produce an informative essay to distinguish between types of pollution and their sources, defining and applying ecology- and conservation-specific terminology. Compare and contrast important connections between pollution and its effects on environmental conditions (i.e. water, soil and air), animal populations, and plant populations.

Fundamentals of Cell Biology

9) Compare basic plant and animal cell biology, including structure and function. Create a visual representation that identifies cellular organelles and major cell processes.

10) Compare and contrast the roles of proteins, carbohydrates, lipids, and nucleic acids as they relate to cell growth and cell reproduction.

Fundamentals of Genetics, Genomics and Heredity

11) Compare the difference between genetics and genomics. Synthesize research to analyze and describe the impact genomics has made in the plant and animal science industry. Compare and contrast the important connections between these advancements including but not limited to the crisper technology and the “Yuck factor”, citing creditable sources.

12) Determine the significance of and relationships between genes, chromosomes, proteins, and hereditary traits. Analyze the role of genes in determining genetic make-up, gender, and hereditary characteristics. Using systems of equations, explain the variation and distribution of genotypes and phenotypes expressed in plants and animals.

Fundamentals of Anatomy and Physiology

13) Using graphic illustrations and supporting text, identify and describe major animal body systems (skeletal, muscular, respiratory, digestive, nervous, circulatory, respiratory, and reproductive) to establish a basic knowledge of their purpose, structure, and function.

Chemistry of Animal Digestion

14) Classify the types of digestive systems in domestic animals, and compare and contrast their anatomical and physiological differences. Synthesize research on animal nutrition (using academic journals or publications from Tennessee Extension Service) to produce an informative narrative, including defining and applying nutrition specific terminology, to examine the stages of digestion and associated processes.

15) Use the periodic table and the atomic chart to compare differences between ionic and covalent bonding as related to digestion. Demonstrate an understanding of the interdependence of the complex chemical and biological processes involved in the digestion process including, but not limited to, elements, compounds, mixtures, and acids.

16) Research the relationship between metabolism, energy, and nutrition. Evaluate life stage and activity level to determine the nutritional needs of animals. Differentiate types of rations to maximize animal performance.

Fundamentals of Plant and Soil Science

17) Apply concepts related to the basic cellular and biochemical processes in plants to demonstrate the following:
    a. Create a graphic illustration of the parts and functions of plant cells
    b. Use quantitative reasoning to balance chemical equations related to plant processes
    c. Interpret the role of physics within the cohesion-tension theory and its significance to plant life
    d. Examine the roles of photopigments and the effects of different colors of light on plant growth

18) Formulate a hypothesis about the correlation between plant nutrient deficiencies and soil composition. Conduct basic soil analysis to determine the chemical elements and nutritional levels available in soils essential for plant growth. Draw conclusions about the ability of soils to meet the nutritional requirements of plants.

Reproductive Systems

19) Research and develop illustrative models that compare and contrast the reproductive structures of plants, drawing out key differences between sexual and asexual reproduction processes.

20) Describe the structure and function of different seed components and summarize their roles in plant reproduction and propagation.

21) Describe the structures and functions of the male and female animal reproductive systems. Compare and contrast the differences of the reproductive systems between small and large animal species.

Principles of Power and Energy

22) Apply fundamental principles of physics as they relate to agricultural power and technology concepts in order to demonstrate the following:
    a. Analyze the relationship between speed, distance, and time
    b. Relate the types of simple machines to the law of machines and mechanical advantages
    c. Specify groups, sources, and forms of energy
    d. Analyze the principle of heat energy and describe the way heat travels
    e. Explain the law of conservation of energy
    f. Explain the production of energy and relate it to the invisible light spectrum

Fundamentals of Electricity

23) Identify different methods by which electrical energy can be produced. Discuss the safety hazards involved in each method as well as prevention and control methods relevant to electrical power supplies. Justify the use of different precautions for the prevention or management of electrical hazards and evaluate the efficacy of the prevention measures.

24) Utilize the appropriate instruments needed to calculate and measure voltage, amperage, resistance, and wattage.

Fundamentals of Engines

25) Apply basic principles of thermodynamics to analyze the function of major components of gasoline and diesel fuel engines.

Using quantitative reasoning and employing appropriate unit conversions, calculate horsepower and thermal efficiency in internal combustion engines by creating systems of equations that describe numerical relationships.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students who are engaging in activities outlined above should be able to demonstrate fluency in Standards AS, CS, and PS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Greenhouse Management

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5954
Prerequisite(s):	*Principles of Plant Science and Hydroculture* (6119)
Credit:	1
Grade Level:	11
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
Programs of Study and Sequence:	This is the third course in the *Horticulture Science* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Vacant, Middle Tennessee FFA Consultant, and Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	OSHA 30-Hour General Industry
Dual Credit or Dual Enrollment Opportunities:	A statewide dual credit challenge examination exists for this course for students to earn dual credit at Tennessee public postsecondary institutions that offer agriculture. For more information, please visit https://www.tn.gov/content/tn/education/early-postsecondary.html.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/ Training:	While not required to teach the course, teachers who use a greenhouse facility or an outdoor lab (cold frame, nursery, etc.) that uses any type of chemical (with an EPA label) shall have the Commercial Pesticide Applicators License for C10 and C15.
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html

Course Description

Greenhouse Management is an applied-knowledge course designed to prepare students to manage greenhouse operations. This course covers principles of greenhouse structures, plant health and growth, growing media, greenhouse crop selection and propagation, and management techniques. Upon completion of this course, proficient students will be equipped with the technical knowledge

and skills needed to prepare for further education and careers in horticulture production. Greenhouse Management is a dual credit course with statewide articulation.

Program of Study Application

This is the third course for the *Horticulture Science* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, & Natural Resources website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

Greenhouse Industry Introduction

1) Analyze the global nature of the horticulture industry and assess the economic impact and technological advancements associated with greenhouse production practices. Create a timeline to summarize the history and development of the greenhouse production industry, citing specific textual evidence.

2) Accurately maintain an activity recordkeeping system and apply proper financial recordkeeping skills as they relate to a greenhouse industry. Demonstrate the ability to analyze records by generating reports and completing related applications (i.e., employment application, efficiency reports, SAE applications, and profit and lost statements).

3) Apply the concepts of occupational safety and industry safety prevention and control standards by interpreting information from industry manuals.
    a. Assess and explain the concepts of the worker protection standards.
    b. Review common laboratory safety procedures for tool and equipment operation in horticulture laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy.

Greenhouse Design, Construction, and Components

4) Describe characteristics of successful greenhouses and create a list of factors for planning and designing greenhouse facilities. Factors shall include physical location, market potential, utilities, climatic conditions, and production goals.

5) Classify greenhouse structures by comparing and contrasting greenhouse construction materials, including but not limited to frames, coverings, and glazing materials. Justify selection of greenhouse construction materials based on cost-effectiveness, stability, maintenance, and function.

6) Create an annotated model representing research-based practices in greenhouse planning and design and justify the process outlined in the model. The design shall include at least the following items: structure materials, layout, lighting, bench arrangements, traffic flow, and physical location.

7) Compare general maintenance and upkeep requirements for a variety of greenhouses in relation to the type of structural framework and associated systems. Create a checklist of prescribed maintenance, preventative maintenance, monitoring, and troubleshooting schedules for greenhouse facilities and equipment. Demonstrate the mechanical skills needed for the general maintenance and repair of greenhouse structures and associated systems (such as framework, equipment, basic wiring, plumbing, and general construction).

Growing Media

8) Compare and contrast the attributes of growing mediums. Write an informative essay to describe the major components of soil and other growing mediums, and identify basic physical and chemical characteristics including structure, texture, alkalinity, water holding capacity, and drainage.

9) Identify and provide written justification to describe the effects of soil and soilless composition (pH, organic matter content, and mineral content) on plant health and growth. Perform basic soil sampling and testing techniques and interpret test data to formulate corrective actions as needed.

10) Explain the principles of media preparation; develop a check sheet to guide media preparation. Describe the purpose, methods, and importance for sterilizing media. Compare and contrast the cost effectiveness of premix and personal mix media to soil media.)

Plant Structure, Function, and Growth

11) Apply concepts of scientific taxonomy and industry-specific terminology in distinguishing different species and types of plants. Create a visual chart, brochure, or fact sheet that identifies common plant species used in greenhouse production by classification, care, and use.

12) Research the basic plant structure components and create an illustrative plant model to identify and differentiate among components. Demonstrate a working knowledge of plant physiology, including:
    a. The relationship between form and function for major plant structures
    b. The anatomical and physiological differences of specific plant species

13) Select relevant technical information to analyze and support claims regarding the relationships between light, temperature, and water on plant growth. Draw conclusions about the interrelationships between plant life processes (such as photosynthesis, respiration, and transpiration), plant growth, and maintenance.

14) Compare and contrast current industry approved methods to regulate plant growth including, but not limited to, environmental, physical, genetic and chemical. Demonstrate in a live setting or in a presentation the ability to apply the best growth regulator to specific plants to obtain selected outcomes.

Plant Nutrition

15) Analyze the nutrient requirements of plants and assess the importance of the 17 essential plant nutrients for plant health. Identify the chemical and biological processes needed to make nutrients available for growth and maintenance, and distinguish among nutrient deficiency and toxicity signs and symptoms in plants.

16) Research case studies to cite specific textual evidence determining the significance of safety hazards associated with fertilizer use. In an informative essay, justify the use of different precautions for the prevention or management of hazards and evaluate the efficacy of prevention measures.

17) Identify the basic types of fertilizers and their applications for greenhouse production crops. Differentiate the effects of fertilizer ratios on plant growth and health to hypothesize possible outcomes of each ratio. Calculate proper formulations of fertilizers based upon label directions using systems of equations. Demonstrate in a live setting or in a presentation the ability to follow fertilizer label procedures precisely as they pertain to selection, handling, application, storage, and disposal.

Plant Propagation

18) Differentiate between the methods of sexual and asexual plant propagation by summarizing valid research. Compare and contrast the different techniques of propagation, explaining advantages and disadvantages of each in an informative text. Conduct at least the following: cutting, budding, layering, sowing, germination rate calculation, and seed viability.

Environmental Control Systems

19) Assess the procedures required for producing multiple commercial plant species in a controlled environment, and apply these procedures to produce a variety of specific greenhouse crops. Evaluate environmental factors that affect greenhouse crops to justify management methods.

20) Evaluate the greenhouse climate and recommend the proper climate control equipment to maintain an optimum growing climate, including but not limited to ventilation, humidifiers, heating, cooling, and shading. Provide written justification for each recommendation.

21) Demonstrate effective methods to meet water requirements for healthy plant growth. Examine and explain how water pH influences plant growth. Research from multiple technical texts the function and operating principles of greenhouse irrigation systems (such as misting, drip, and overhead systems) to meet watering requirements for the purposes of maintaining optimum moisture level for a variety of plants.

Diseases, Disorders, and Pests

22) Determine the economic and aesthetic impact of plant diseases, disorders, and pests. Identify and diagnose the symptoms of common plant diseases, disorders, and pests, and summarize

methods of prevention, treatment, and control by drawing evidence from informational texts and relevant scientific literature.

23) Identify the types of pesticides and their applications for greenhouse production. Research the safety hazards associated with pesticide use for multiple greenhouse pesticides. Calculate proper formulations of pesticides based upon label directions for specific pests by creating systems of equations that describe numerical relationships.

24) Demonstrate in a live setting or in a presentation the ability to follow pesticide procedures precisely according to label and safety guidelines, including selection, handling, personal protective equipment (PPE), application, storage, and disposal.

25) Evaluate the basic principles and assess the overall effectiveness of integrated pest management (IPM) for controlling greenhouse pests and diseases. Compare with traditional chemical controls.

Hydroponic Applications

26) Examine the roles of hydroponic systems in greenhouse crop production. Describe essential elements of hydroponic systems; explore recent trends and advancements to design a hydroponic system for a specific greenhouse crop.

27) Apply basic principles of hydroponics to compare hydroponic and soil-based growing methods for providing nutrients to plants. Summarize the advantages and disadvantages of using soilless media systems to evaluate the efficacy for specific crops.

Greenhouse Business Management

28) Debate laws and regulations affecting horticulture businesses. Demonstrate the use of general business and recordkeeping skills necessary to manage a horticultural business, including but not limited to marketing, advertising, product displays, scheduling, inventory control, merchandise handling and profit and loss statements.

29) Research, develop, and implement greenhouse production schedules for a representative sampling of greenhouse crops that includes at least the following: plant selection, plant material cost (seed, plug, cuttings), growth media, fertilizers, water, testing kits, pricing guides, profit margin, labor, and other expenses.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate

fluency in Standards ABS.03, ABS.07, CS, PS.01, PS.02, and PS.03 at the conclusion of the course.

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Landscaping and Turf Science

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5951
Prerequisite(s):	*Greenhouse Management* (5954)
Credit:	1
Grade Level:	12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
Programs of Study and Sequence:	This is the fourth and final course in the *Horticulture Science* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Joshua.Bledsoe@tn.gov Stena Meadows, East Tennessee FFA Consultant, Stena.Meadows@tn.gov Vacant, Middle Tennessee FFA Consultant Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	OSHA 30-Hour General Industry, Tennessee Commerical Pesticide Certification – Ornamental and Turf Pest Control (C03), and/or Tennessee Specific Industry Certification (TSIC) for Horticulture Science
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html

Course Description

Landscaping and Turf Science is a applied course designed to provide challenging academic standards and relevant technical knowledge and skills needed for further education and careers in landscape design, maintenance, and turf management. Content includes site analysis and planning, principles of design, and plant selection and care techniques. Upon completion of this course, proficient

students will be prepared to pursue advanced study of landscaping and turf science at a postsecondary institution.

Program of Study Application

This is the fourth and final course in the *Horticulture Sciences* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, & Natural Resources website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

Introduction to Landscaping and Turf Management

1) Gather and analyze labor data from sources such as the United States Bureau of Labor Statistics and the Tennessee Department of Labor to predict the employment outlook in landscaping and turf management careers. Summarize the interpersonal, business, and technical skills needed for a career in landscaping or turf management. Develop a resume for a selected occupation that includes documented development of industry-related skills (i.e., work experience, SAE records, and proficiency applications).

2) Explain general occupational and horticulture industry safety standards. Identify commonly used machinery and equipment and develop a checklist of associated safety and maintenance procedures. Assess and explain the concepts of the worker protection standards, complete required safety tests with 100 percent accuracy.

Tree and Shrub Selection and Maintenance

3) Develop illustrative models that identify the basic parts of trees and shrubs. Demonstrate the ability to visually identify and distinguish between common tree and shrub species used for landscaping and describe research-based practices in harvesting, transportation, transplanting, and care.

4) Using descriptive text, summarize methods for general care and maintenance of trees and shrubs, including planting, pruning, mulching, and fertilizing techniques. Drawing on research and technical data, justify the importance of site evaluation, preparation, and consideration of hardiness zones in the selection of trees and shrubs.

Plant Selection and Maintenance

5) Visually identify and distinguish among common ground cover, vines, and plants used for landscaping. Evaluate the function, form, and growth requirements for common perennials, annuals, and biennials.

6) Assess methods for general care and maintenance of ground cover, vines, and plants, including planting, pruning, mulching, and fertilizing techniques. Recommend specific vines

and ground covers to solve special landscaping issues, and justify recommendations in an informative text citing textual and technical evidence.

Turf Grass Selection and Maintenance

7) Cite specific textual evidence to compare and contrast the functions and components of turf grasses of common turf grass species. Demonstrate the ability to visually identify and distinguish between turf grass species and cultivars and create an informational text or presentation justifying their applications for specific uses.

8) Describe methods for the establishment and maintenance of turf grasses, including soil preparation, installation, water, nutrient and pH needs, and fertilization techniques. Analyze fertilizer requirements and calculate appropriate fertilizer ratios. Draw conclusions about the importance of site selection, site preparation, and consideration of hardiness zones in the selection of turf grass species and cultivars.

9) Evaluate and compare special management needs of residential, commercial, and sports turf. Identify management practices and associated equipment requirements for mowing, irrigation and weed, disease, and fungus control for common turf grass species.

Commercial Interior Plantscaping

10) Identify and classify basic ornamental flowers and plants (i.e. potted, cut) used for the commercial interior plantscape, and summarize their propagation, installation techniques, and maintenance requirements, citing applicable technical texts. Drawing on knowledge acquired in previous courses, demonstrate in a live or presentation format the ability to construct an interior display using a variety of plant materials, including but not limited to foliage, flowering plants (both cut and potted), live, and permanent/silk plants.

11) Identify and recommend effective management practices for the interior environment, including light, humidity, growing media, and disease and pest control. Compare and contrast decorative accessory items (containers, planters, water features, permanent/silk plants, live plants) in the interior plantscape.

Pest Management

12) Identify and compare the common landscape and turf grass pests and their respective prevention and control methods. Categorize the basic types of pesticides and describe their application methods, including but not limited to rate, environmental conditions, and reentry times. Using quantitative reasoning and appropriate units, calculate proper formulations of pesticides based upon label directions.

13) Demonstrate in a live setting or in a presentation the ability to properly mix and apply pesticides precisely, attending to important safety standards, selection, handling, application, storage, and disposal

Water Management

14) Develop a written resource describing the seven principles of xeriscaping and indications for use in landscapes, citing specific textual evidence.

15) Examine the various types of water gardens and pools and their applications for landscape enhancement. Develop a customer information packet outlining best management practices to maintain a healthy water garden and pool, addressing at minimum the following considerations: pH, nitrate, dissolved oxygen, algae, pollutants, filter requirements, and feed schedules.

16) Compare and contrast different irrigation systems and summarize their advantages and disadvantages. Identify irrigation tools and system components and their function or application. Applying basic plumbing principles, calculate the water supply flow rate, head pressure requirements, and pipe and pump size considerations for a water garden, pool, or irrigation system. Identify and demonstrate the plumbing skills required to install irrigation and water features in a landscape or turf setting.

17) Design an irrigation system for a residential landscape and develop a bid presentation that identifies the project timeline, required permits, costs of installation and selected materials.

Landscape Design

18) Interpret topographical and soil maps to evaluate site suitability for selected landscape plants. Create a site analysis checklist to evaluate a proposed landscape site.

19) Develop a list of tools and skills necessary for drafting landscape designs, including computer-assisted methods. Demonstrate the use of drafting tools and design equipment to create a basic landscape design.

20) Explore landscape design principles to outline the components of a comprehensive landscape design plan. Prepare comprehensive landscape plans using prospective residential and commercial plots and develop a landscape bid package and presentation for each plan.

Business Principles of Landscaping and Turf Management

21) Compare and contrast different business models. Create a chart to illustrate the use, advantages, and disadvantages of each. Research successful local landscaping and turf grass management businesses and use evidence from research to evaluate the skills and resources utilized for successful small business implementation.

22) Using industry-specific terminology, explain the process for preparing a price estimate for landscape designs and packages. Create a price estimate and develop a presentation to secure a bid on a landscape project.

23) Demonstrate the ability to interpret and read landscape drawings by measuring and calculating materials needed to execute the plan. Evaluate factors that affect profitability.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards PS and CS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Large Animal Science

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	6116
Prerequisite(s):	*Small Animal Science* (5958)
Credit:	1
Grade Level:	11
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
Programs of Study and Sequence:	This is the third course in the *Veterinary and Animal Science* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Stena.Meadows@tn.gov Vacant, Middle Tennessee FFA Consultant Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	OSHA 30-Hour General Industry and/or Tennessee Specific Industry Certification (TSIC) for Animal Science
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution. Dual enrollment opportunities available through Tennessee State University and the University of Tennessee, Martin
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html

Course Description

Large Animal Science is an applied course in veterinary and animal science for students interested in learning more about becoming a veterinarian, vet tech, vet assistant, or pursuing a variety of scientific, health, or agriculture professions. This course covers anatomy and physiological systems of different

groups of large animals, as well as careers, leadership, and history of the industry. Upon completion of this course, proficient students will be prepared for success in the level-four *Veterinary Science* course and further postsecondary training.

Program of Study Application

This is the third course in the *Veterinary and Animal Sciences* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, & Natural Resources website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

History of Domestication

1) Synthesize research on the history of large animal domestication to produce an informative essay, including defining and applying industry-specific terminology to classify animals in the correct taxonomy. Justify the historical uses and roles of domesticated animals, and compare historical processes of large animal domestication.

Economic, Occupational and Technological Implications

2) Determine the general economic impact of the large animal industry by investigating both recreational and business implications of large animal domestication through governmental and news publications. Develop a summary including both graphical representations and descriptive text to summarize findings.

3) Explore and compare local and regional career opportunities in the large animal industry and evaluate labor data to predict the employment outlook. Describe in a written or visual representation the knowledge, skills, and abilities necessary for a diverse range of careers in large animal sciences citing specific textual evidence from local job postings and Tennessee labor data.

4) Accurately maintain an activity recordkeeping system and apply proper accounting and financial records as they relate to a large animal science supervised agricultural experience (SAE) program or enterprise. Demonstrate the ability to summarize business records such as individual enterprise budgets, profit and lost statements, inventory management, transportation cost, and other specific reports by completing SAE and related financial applications.

5) Examine specific technologies that have evolved within the large animal industry (such as, but not limited to equipment, housing, procedures, and healthcare) and evaluate the economic and societal implications of each.

Personal and Occupational Health and Safety

6) Identify, research, and determine the significance of zoonotic diseases associated with large animals. Compare and contrast findings from multiple credible sources relating to a specific disease (including student's own experience or laboratory experiment, case studies, and scholarly journals). Justify the use of different methods of infection control in the prevention or management of a zoonotic disease and evaluate the efficacy of existing large animal biosecurity measures.

7) Correctly identify and summarize laws and regulations that pertain to large animal health and safety in an explanatory text, citing specific textual evidence from state and national legislation. Describe health requirements and necessary documentation for large animal transportation and change of ownership.

8) Review common laboratory safety procedures for tool and equipment operation in the large animal laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy.

9) Demonstrate in a live setting or in a presentation the ability to follow procedures precisely, attending to special cases or exceptions noted in appropriate materials, and apply them to the following areas:
    a. Animal restraint and handling
    b. Techniques for transportation
    c. Appropriate use of chemicals (such as pesticide, fungicide, disinfectants)
    d. Differentiate between effective methods for handling large animals and methods proven to be less effective.

Animal Ethics

10) Identify the fundamental philosophies related to animal rights and animal welfare. Compare the impact of specific persons, organizations, and legislation related to animal rights and welfare of large animals.

11) Investigate current large animal issues by analyzing an author's purpose and assessing the extent to which the reasoning and evidence in a specific text support the author's claim. Debate specific issues by forming and supporting claims and counterclaims with specific data and evidence. Issues related to animal rights and animal welfare may include, but are not limited to:
    a. Abuse and/or neglect
    b. Environmental implications
    c. Consumer product implications
    d. Exhibiting and showing
    e. Global issues in large animal ethics and their relation to local problems

Nutrition and Digestive Systems

12) Create a visual representation to differentiate between ruminant and non-ruminant animals and monogastric and polygastric animals, comparing and contrasting their anatomical and physiological differences. Explain the relationships of digestive system types to the ability of an animal to digest and absorb different classes of feed.

13) Using information from scholarly journals or Tennessee Extension Service, research nutrient requirements of the diets of large animals and organize these into various nutrient groups. Differentiate between roughages and concentrates and their nutritional values.

14) Interpret feed labeling and evaluate factors such as life stage and activity level to determine the nutritional needs and then recommend balance rations for each large animal species, justifying recommendations with evidence from the text.

15) Diagnose the symptoms of nutritional diseases relevant to large animals and recommend the appropriate control procedures, citing specific evidence to support recommendations.

Genetics, Reproduction, and Genomics

16) Research and develop illustrative models of the major components of male and female reproductive systems in large animals and prepare a short narrative to distinguish the function of reproductive organs, endocrine glands, and hormones. Produce an explanatory essay comparing the physiological changes that occur across different species during reproductive phases, including the estrous cycle, fertilization, gestation, parturition and lactation.

17) Using graphical representations and descriptive text, explain how the roles of heritability, selection intensity, generation interval, and other advanced principles of genetics (such as DNA testing for disorders) apply to predict gene and trait transfer in large animal species. Principles include but are not limited to:
    a. Economically important traits in production animals (i.e. artificial reproduction methods)
    b. Interpretation and utilization of animal performance records (i.e. Expected Progeny Difference [EPD])
    c. Hybrid vigor

18) Interpret instructional materials including online resources to compare and contrast the advances in the livestock industry by using genomic markers and genomic EPDS. Write a brief paper that discusses the acceleration of genetic selection, mapping of complex traits, mapping of disease structures, and improved consistency of progeny outcomes.

Fundamental Care and Health of Horses

19) Synthesize research on the historical importance of horses, noting major economic, social, and medical advances impacting domestication. Produce an informational essay or model (such as a timeline, graphical illustration, or presentation) that formulates comparisons

among different horse breeds and hybrids. Demonstrate conceptual understanding and technical skill in current practices of comprehensive health care and management for the following:

a. Design appropriate facilities based on assessment of needs and present plans in a visual format
b. Compare appropriate owner/handler responses to behaviors and instincts to ensure safety of both handler and animal in a variety of situations
c. Distinguish between clinical signs of proper health and poor health, justifying explanations with data and evidence
d. Using quantitative reasoning and appropriate units, calculate appropriate rations based on animal characteristics (age, weight, breed, activity level) and nutritional needs by creating systems of equations that describe numerical relationships
e. Illustrate the reproductive cycle graphically, and summarize available breeding methods and current reproductive technologies
f. Research common diseases and parasites and their effects on the health of horses, and draw evidence from the most recent medical literature to recommend the best prevention or control measures.

Fundamental Care and Health of Cattle

20) Synthesize research on the historical importance of cattle, noting major economic, social, and medical advances impacting domestication. Produce an informational essay or model (such as a timeline, graphical illustration, or presentation) that formulates comparisons among different cattle breeds. Demonstrate conceptual understanding and technical skill in current practices of comprehensive health care and management for the following:
    a. Design appropriate facilities based on assessment of needs and present plans in a visual format
    b. Compare appropriate owner/handler responses to behaviors and instincts to ensure safety of both handler and animal in a variety of situations
    c. Distinguish between clinical signs of proper health and poor health, justifying explanations with data and evidence
    d. Using quantitative reasoning and appropriate units, calculate rations based on animal characteristics (age, weight, breed, activity level) and nutritional needs by creating systems of equations that describe numerical relationships
    e. Illustrate the reproductive cycle graphically, summarize available breeding method, and current reproductive technologies
    f. Research common diseases and parasites and their effects on the health of cattle, and draw evidence from the most recent medical literature to recommend the best prevention or control measures
    g. Evaluate the economic implications of livestock management practices (such as dehorning)

Fundamental Care and Health of Small Ruminants (Sheep, Goats, Alpacas, and Llamas)

21) Synthesize research on the historical importance of small ruminant breeds, noting major economic, social, and medical advances impacting domestication. Produce an informational essay or model (such as a timeline, graphical illustration, or presentation) that formulates

comparisons among different sheep, goat, alpaca, and llama breeds. Demonstrate conceptual understanding and technical skill in current practices of comprehensive health care and management for the following:

a. Design appropriate facilities based on assessment of needs and present plans in a visual format
b. Compare appropriate owner/handler responses to behaviors and instincts to ensure safety of both handler and animal in a variety of situations
c. Distinguish between clinical signs of proper health and poor health, justifying explanations with data and evidence
d. Using quantitative reasoning and appropriate units, calculate appropriate rations based on animal characteristics (age, weight, breed, activity level) and nutritional needs by creating systems of equations that describe numerical relationships
e. Illustrate the reproductive cycle graphically, and summarize available breeding methods and current reproductive technologies
f. Research common diseases and parasites and their effects on the health of sheep and goats, and draw evidence from the most recent medical literature to recommend the best prevention or control measures

Fundamental Care and Health of Swine

22) Synthesize research on the historical importance of swine, noting major economic, social, and medical advances impacting domestication. Produce an informational essay or model (such as a timeline, graphical illustration, or presentation) that formulates comparisons among different swine breeds. Demonstrate conceptual understanding and technical skill in current practices of comprehensive health care and management for the following:
    a. Design appropriate facilities based on assessment of needs and present plans in a visual format
    b. Compare appropriate owner/handler responses to behaviors and instincts to ensure safety of both handler and animal in a variety of situations
    c. Distinguish between clinical signs of proper health and poor health, justifying explanations with data and evidence
    d. Using quantitative reasoning and appropriate units, calculate appropriate rations based on animal characteristics (age, weight, breed, activity level) and nutritional needs by creating systems of equations that describe numerical relationships
    e. Illustrate the reproductive cycle graphically, and summarize available breeding methods and current reproductive technologies
    f. Research common diseases and parasites and their effects on the health of swine, and draw evidence from the most recent medical literature to recommend the best prevention or control measures

Fundamental Care and Health of Poultry

23) Synthesize research on the historical importance of poultry, noting major economic, social, and medical advances impacting domestication. Produce an informational essay or model (such as a timeline, graphical illustration, or presentation) that formulates comparisons among different poultry breeds. Demonstrate conceptual understanding and technical skill in current practices of comprehensive health care and management for the following:

a. Design appropriate facilities based on assessment of needs and present plans in a visual format
b. Compare appropriate owner/handler responses to behaviors and instincts to ensure safety of both handler and bird in a variety of situations
c. Distinguish between clinical signs of proper health and poor health, justifying explanations with data and evidence
d. Using quantitative reasoning and appropriate units, calculate appropriate rations based on bird characteristics (age, weight, breed, activity level) and nutritional needs by creating systems of equations that describe numerical relationships
e. Illustrate the reproductive cycle graphically, and summarize available breeding methods and current reproductive technologies
f. Research common diseases and parasites and their effects on the health of poultry, and draw evidence from the most recent medical literature to recommend the best prevention or control measures

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards AS and CS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Principles of Agribusiness

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5946
Prerequisite(s):	*Agriscience* (5957)
Credit:	1
Grade Level:	10
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
Programs of Study and Sequence:	This is the second course in the *Agribusiness* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Stena.Meadows@tn.gov Vacant, Middle Tennessee FFA Consultant Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/ Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html

Course Description

Principles of Agribusiness teaches students to apply the economic and business principles involved in the sale and supply of agricultural products to a wide range of careers across the industry and builds foundational knowledge of finance and marketing principles. Upon completion of this course, proficient students will be prepared for more advanced coursework in the Agribusiness program of study.

Approved April 10, 2015; Amended April 15, 2016

Program of Study Application

This is the second course in the *Agribusiness* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, & Natural Resources website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

Introduction to Agribusiness

1) Explore and compare local, regional, state, national, and global career opportunities in the agribusiness industry. Drawing evidence from multiple sources, such as but not limited to the United States Bureau of Labor Statistics, Organization for Economic Co-operation and Development, and Tennessee Department of Labor and Workforce Development, to evaluate labor data on viable career pathways in an agribusiness-related field. Describe in a written or visual representation the knowledge, skills, and abilities necessary for a range of careers in agribusiness.

2) Examine specific business practices, laws, regulations, and technologies that have evolved within the agribusiness sector, and evaluate the economic and societal implications of each. Explain in an informative essay how these advances have influenced the agriculture industry, citing specific textual evidence from case studies or legislation.

3) Create a graphic illustration comparing and contrasting regulations in the United States with those in countries from which the U.S. imports agricultural products, citing evidence from governmental agencies and news organizations. Analysis should address governing agencies, subsidies, and trade agreements.

Business Concepts and Structures

4) Compare and contrast types of business ownership models including at minimum the following: sole proprietorship, partnerships, small businesses, cooperatives, limited liability corporations, and corporations. In a narrative referencing agribusiness examples, explain the organizational structure of each model and describe its advantages and disadvantages to both owner and customer.

5) Write a business plan for an agricultural entrepreneurial enterprise that includes basic business and entrepreneurship principles such as budget, target customer, product information and risk assessment. Develop a three minute speech to pitch the plan to prospective investors. As an extension, apply principles of the business plan for use as a Supervised Agricultural Experience (SAE) program.

6) Define and analyze the relationships among basic business concepts used in agribusiness, including the business cycle, profit, loss, competition, equilibrium price, ethics, social responsibility, and supply and demand. Develop a visual representation (i.e., chart, table,

graph, mind map) to illustrate situations that would affect supply and demand of an agricultural product nationally and globally.

Accounting Practices

7) Using case studies, actual spreadsheets, forms, and instructional materials, explain how components of financial recordkeeping affect operations and management decisions for an agricultural enterprise. Components include the general journal, balance sheet, cash flow statements, financial statements, reconciliation of accounts, depreciation, net worth, income statements, and profit and loss statements.

Markets and Futures

8) Compare the costs affecting the production of agricultural products (such as basic logistics, input costs) with the costs of producing and marketing non-agricultural products.

9) Research and explain the economic impact of agriculture futures and commodities on the local, state, national and the global economy. Identify the top ten agricultural commodities and describe the factors that impact their values and trading patterns. Predict the value of each commodity at a specified point in time.

10) Anaylze the top new trends impacting the agricultural industry including the affected products, commodities and/or services. Predict how these advancements will change the price points and cost projections for different agricultural products and services. Present predictions referencing credible sources and include the advantages, disadvantages, and projected changes to the product, commodities, and/or services as a result of your recommendation of this new trend.

11) Compare and contrast the sale of agricultural products through local marketing (such as farmers markets, buyers, and marketing cooperatives) to the sale of products in futures markets, supporting analysis with graphic illustrations (such as charts, tables, graphs) and explanatory narratives.

Sales and Marketing

12) Describe basic marketing principles fundamental to the sale of agriculture products, including but not limited to benefit and cost analysis, impact and application of online mediums, value-added, and niche marketing.

13) Research an agricultural product or service to determine its features and consumer benefits. Identify appropriate marketing strategies and target audiences; develop and present materials designed to market the product or service.

14) Demonstrate understanding of basic sales principles by writing scripts for a role play between an agricultural product salesperson and a customer. Include determination of customer needs, presentation of features and benefits, possible objections, suggestive selling item(s), and closing strategies. Follow up with techniques used for post-sale communications.

15) Develop and present an agricultural marketing or sales plan on a specific product or service. The plan should include at least the following: a mission statement, long- and short-term smart goals, target markets, profit and loss projections, industry trends, and product samples.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards ABS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Principles of Plant Science and Hydroculture

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	6119
Prerequisite(s):	*Agriscience* (5957)
Credit:	1
Grade Level:	10
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
Programs of Study and Sequence:	This is the second course in the *Horticulture Science* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Vacant, Middle Tennessee FFA Consultant, and Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit opportunities for this course. Dual enrollment opportunities are available at the University of Tennessee, Martin. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	While not required to teach the course, teachers who use a greenhouse facility or an outdoor lab (cold frame, nursery, etc.) that uses any type of chemical (with an EPA label) shall have the Commercial Pesticide Applicators License for C10 and C15.
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html

Approved April 10, 2015; Amended April 15, 2016

Course Description

Principles of Plant Science and Hydroculture focuses on essential knowledge and skills related to the science of plant growth. This course covers principles of plant health, growth, reproduction, and biotechnology, as well as fundamental principles of hydroponics and aquaponics. Upon completion of this course, proficient students will be prepared for more advanced coursework in horticulture science.

Program of Study Application

This is the second course in the *Horticulture Science* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, and Natural Resources website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

Safety

1) Differentiate general occupational safety prevention and control standards as related to the plant science and hydroculture industry. Apply concepts of safety procedures to complete safety test with 100 percent accuracy. Demonstrate the safety concepts as outlined in the Tennessee worker protection standards.

Plants, Society, and the Environment

2) Investigate the roles of cultivated plants in meeting the food, fiber, fuel, medicinal, aesthetic, and occupational needs of society. Identify and describe the different domains of the horticulture industry, in an informative text. Examine current issues and trends affecting horticulture professionals in the industry. Cite specific textual evidence from government publications and reputable news media.

3) Summarize the impact and patterns of environmental factors on plant biodiversity by examining research from academic journals, news articles, and government publications. Describe important characteristics of the relationships between plants and other organisms, including basic plant-human interactions, plant-animal interactions, and plant adaptation.

Principles of Soil Science

4) Evaluate, citing specific textual evidence, the physical and chemical properties of soils in an informative text. Perform technical procedures to classify soils by evaluating biotic and abiotic factors such as soil pH, texture, permeability, and water holding capacity. Interpret test results to identity deficiencies and formulate appropriate corrective actions.

5) Describing factors that influence soil quality and erosion. Assess the extent to which reasoning and evidence presented in news articles or case studies support the use of a specific soil conservation practice for maintaining healthy growing media for plants.

6) Cite specific textual evidence for the analysis of land selection and conservation practices that ensure optimal productivity and stewardship. Identify factors that affect site selection for plant growth and draw evidence from multiple authoritative sources to appraise and justify management practices that ensure appropriate use of land resources.

Plant Structure and Function

7) Integrate print and digital sources to create a model depicting the parts of plant cells. Examine the structure and outline the functions of plant cell organelles.

8) Analyze plant anatomy and physiology and relate key concepts to the processes and requirements involved in plant growth and productivity.

Plant Nutrition

9) Analyze the nutrient requirements of plants and assess the importance of essential plant nutrients to plant growth and development. Use visual representations to illustrate the chemical and biological processes, including photosynthesis, that make nutrients available to plants for growth and maintenance.

10) Justify the use of fertilizers as a source of essential plant nutrients. Calculate fertilizer formulations and perform different methods of fertilizer application.

11) Research the nutritional factors that influence plant health to identify nutritional deficiencies and disorders. Compile observations to distinguish between the signs of nutrient deficiency in plants and defend recommendations for appropriate treatments.

Plant Diseases and Pests

12) Research the principles of disease and pest control to plant health, growth, and maintenance. Analyze the effects of different types of plant pests and diseases; prescribe methods for pest and disease prevention and treatment.

13) Demonstrate understanding of common classes of chemicals used for pest management. Gather and evaluate information regarding PPE (Personal Protective Equipment) for chemical application and demonstrate appropriate use of PPE. Create a checklist for safe storage and handling of pesticides.

Plant Breeding, Genetics, and Genomics

14) Analyze the reproductive structures in plants and describe how they function in both sexual and asexual plant reproduction.

15) Investigate the role of DNA, heritability, and genetic applications in plant breeding and compose an informative essay that describes how mutation, gene flow, and adaption influence plant populations. Identify desirable traits in various plant species and predict the probable outcome of genetic crosses based on Mendel's laws.

16) Using graphic representation and descriptive text, explain how the principles of genetics and genomic apply to the advances in plant science including the acceleration of genetic selection, mapping of complex traits, and mapping of disease structures.

Plant Biotechnology

17) Distinguish the branches of science that influence plant biotechnology and summarize important historical achievements. Examine the role and importance of genetic principles to improving plant characteristics and perform basic plant DNA extraction procedures.

18) Research current and emerging plant biotechnologies and construct an argumentative essay to support a claim supporting or opposing the use of a specific biotechnology in horticulture. Justify and debate ethical, legal, and economic issues surrounding plant biotechnology.

Fundamentals of Hydroponics and Aquaponics

19) Evaluate the significance of hydroponics and aquaponics technology as related to sustainable practices and principles. Compare and contrast production systems and techniques utilized in the hydroponics and aquaponics fields, including structures and equipment, production methods, and common crops.

20) Assess the functions, attributes, and desirable properties of soilless growing media. Write an informative essay to describe the major components of soilless media, identifying basic physical and chemical characteristics.

21) Apply concepts learned in this course to visually identify common plant and animal species used for hydroponic and aquaponic production, and distinguish between their structural and physiological differences, as well as their specific production applications.

22) Examine the role that water chemistry plays in the development of water quality for plant production. Demonstrate the ability to perform common tests to evaluate water quality factors including pH, hardness, ammonium, nitrate, nitrite, dissolved oxygen, and ammonia levels.

23) Analyze the effects of environmental conditions on aquatic plant and animal life. Adjust water quality factors by using quantitative reasoning and appropriate units to calculate proper formulations of chemicals based upon label directions.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards BS and PS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Small Animal Science

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5958
Prerequisite(s):	*Agriscience* (5957)
Credit:	1
Grade Level:	10
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
Programs of Study and Sequence:	This is the second course in the *Veterinary and Animal Sciences* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Stena.Meadows@tn.gov Vacant, Middle Tennessee FFA Consultant Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html

Course Description

Small Animal Science is an intermediate course in animal science and care for students interested in learning more about becoming a veterinarian, vet tech, vet assistant, or pursuing a variety of scientific, health, or agriculture professions. This course covers anatomy and physiological systems of different groups of small animals, as well as careers, leadership, and history of the industry. Upon completion

of this course, proficient students will be prepared for more advanced coursework in veterinary and animal science.

Program of Study Application

This is the second course in the *Veterinary and Animal Sciences* programs of study. For more information on the benefits and requirements of implementing this program in full, visit the Agriculture, Food, and Natural Resoruces website at: https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html.

Course Standards

History of Domestication

1) Synthesize research on the history of small animal domestication to produce an informative essay, including defining and applying industry-specific terminology to classify animals in the correct taxonomy. Justify the historical uses and roles of domesticated animals, and compare historical processes of small animal domestication.

Economic, Occupational, and Technological Implications

2) Determine the general economic impact of the small animal industry by investigating both home and business implications of small animal domestication through governmental and news publications.

3) Explore and compare local and regional career opportunities in the small animal industry. Describe in a written or visual representation the knowledge, skills, and abilities necessary for a diverse range of careers in small animal sciences, citing specific textual evidence from local job postings and Tennessee labor data.

4) Accurately maintain an activity recordkeeping system and apply proper accounting and financial records as they relate to a small animal science supervised agricultural experience (SAE) program or enterprise. Demonstrate the ability to summarize business records such as individual enterprise budgets, profit and loss statements, inventory management, transportation cost, and other specific reports by completing SAE and related financial applications.

5) Examine specific technologies that have evolved within the small animal industry (such as, but not limited to, equipment, procedures, and healthcare) and evaluate the economic and societal implications of each.

Personal and Occupational Health and Safety

6) Identify, research, and determine the significance of zoonotic diseases associated with small animals. Compare and contrast findings from multiple sources relating to a specific disease (including student's own experience, laboratory experiment, case studies, and scholarly journals). Justify the use of different methods of infection control in the prevention or

management of a zoonotic disease and evaluate the efficacy of existing small animal biosecurity measures.

7) Correctly identify and summarize laws and regulations that pertain to small animal health and safety in an explanatory text, citing specific textual evidence from state and national legislation. Describe health requirements and necessary documentation for small animal transportation and change of ownership.

8) Review common laboratory safety procedures for tool and equipment operation in the small animal science laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy.

9) Demonstrate in a live setting or in a presentation the ability to follow procedures precisely, attending to special cases or exceptions noted in appropriate materials, and apply them to the following areas:
    a. Animal restraint and handling
    b. Techniques for transportation
    c. Appropriate use of chemicals (such as pesticide, fungicide, disinfectants)

    Differentiate between effective methods for handling small animals and methods proven to be less effective.

Responsible Pet Ownership

10) Research and prepare informational resources for potential pet owners (such as fact sheets, brochures, posters, or presentations) that present the benefits and responsibilities of pet ownership, including listing important factors to consider when choosing a pet, comparing and contrasting available sources for obtaining a pet, identifying and summarizing common laws governing pet ownership, and investigating the societal and economic issues that may impact pet owners.

11) Drawing from multiple sources on small animal management practices, craft an argumentative essay that contrasts the characteristics of responsible pet ownership with ownership practices that have been shown to be negligent or inappropriate. Using supporting evidence from the research to develop claim(s) and counterclaim(s), argue why certain practices fail and others succeed. Topics may include:
    a. Training and behavior management
    b. Housing, boarding, and transporting
    c. Breeding
    d. Feeding and nurturing
    e. Management of health conditions
    f. Matching of animal type/breed and owner lifestyle (including living conditions, geographic location, and number and age of family members)

Animal Ethics

12) Identify the fundamental philosophies related to animal rights and animal welfare. Compare the impact of specific persons, organizations, and legislation related to animal rights and welfare of small animals, citing specific textual evidence.

13) Investigate current small animal issues by analyzing an author's purpose and assessing the extent to which the reasoning and evidence in a specific text support the author's claim. Debate specific issues by forming and supporting claims and counterclaims with specific data and evidence. Issues related to animal rights and animal welfare may include, but are not limited to:
    a. Abuse and/or neglect
    b. Illegal capture and/or trade
    c. Overpopulation
    d. Control of populations
    e. Euthanasia
    f. Exhibiting and showing
    g. Global issues in small animal ethics and their relation to local problems.

Nutrition and Digestive Systems

14) Create a visual representation to differentiate between ruminant and non-ruminant animals, comparing and contrasting their anatomical and physiological differences.

15) Using information from scholarly journals or Tennessee Extension Service, research nutrient requirements of the diets of small animals and organize these into various nutrient groups. Interpret feed labeling and evaluate factors such as life stage and activity level to determine the nutritional needs and then recommend balance rations for small animals, justifying recommendations with evidence from the text.

16) Distinguish among the symptoms of nutritional diseases relevant to small animals and recommend the appropriate control procedures, expressed in writing.

Genetics, Reproduction, and Genomics

17) Research and develop illustrative models of the major components of male and female reproductive systems in small animals and prepare a short narrative to distinguish the function of reproductive organs, endocrine glands, and hormones. Produce an explanatory essay summarizing the physiological changes that occur during reproductive phases, including the estrus cycle, fertilization, gestation, parturition and lactation.

18) Using graphic representations and descriptive text, explain how the fundamental principles of genetics and genomics apply to the study of small animals. Principles should include aspects of the concepts of inheritance, gene transfer, lineage tracing of bloodlines, mapping of traits and mapping of diseases.

Fundamental Care and Health of Dogs and Cats

19) Synthesize research on the historical importance of dogs and cats, noting major economic, social, and medical advances impacting domestication. Produce an informational essay or model (such as a timeline, graphical illustration, or presentation) that differentiates between the defining characteristics of common dog and common cat breeds. Demonstrate conceptual understanding and technical skill in current practices of comprehensive health care and management for the following:
    g. Precisely follow effective grooming procedures and techniques to maintain healthy skin, coat, nails, eyes, and ears
    h. Design appropriate facilities based on assessment of needs and present plans in a visual format
    i. Identify appropriate owner/handler responses to behaviors and instincts to ensure safety of both individual and small animal in a variety of situations
    j. Distinguish between clinical signs of proper health and poor health, justifying explanations with data and evidence
    k. Using quantitative reasoning and appropriate units, calculate rations based on animal characteristics (age, weight, breed, activity level) and nutritional needs
    l. Illustrate the reproductive cycle graphically, and summarize available breeding methods and current reproductive technologies
    m. Research common diseases and parasites and their effects on the health of dogs and cats, and draw evidence from relevant medical literature to recommend the best prevention or control measures.

Fundamental Care and Health of Rabbits, Guinea Pigs, Chinchillas, and Rodents

20) Synthesize research on the historical importance of rabbits, guinea pigs, chinchillas, and rodents, noting major economic, social, and medical advances impacting domestication. Produce an informational essay or model (such as a timeline, graphical illustration, or presentation) that differentiates between their defining characteristics. Demonstrate conceptual understanding and technical skill in current practices of comprehensive health care and management for the following:
    a. Precisely follow effective grooming procedures and techniques to maintain healthy skin, coat, nails, eyes, and ears
    b. Design appropriate facilities based on assessment of needs and present plans in a visual format
    c. Identify appropriate owner/handler responses to behaviors and instincts to ensure safety of both individual and small animal in a variety of situations
    d. Distinguish between clinical signs of proper health and poor health, justifying explanations with data and evidence
    e. Using quantitative reasoning and appropriate units, calculate rations based on animal characteristics (age, weight, breed, activity level) and nutritional needs
    f. Illustrate the reproductive cycle graphically, and summarize available breeding methods and current reproductive technologies
    g. Research common diseases and parasites and their effects on the health of rabbits, guinea pigs, chinchillas, and rodents, and draw evidence from the most recent medical literature to recommend the best prevention or control measures.

Fundamental Care and Health of Avians, Fish, Amphibians, and Reptiles

21) Synthesize research on the historical importance of avians, fish, amphibians, and reptiles, noting major economic, social, and medical advances impacting domestication. Produce an informational essay or model (such as a timeline, graphical illustration, or presentation) that differentiates between their defining characteristics. Demonstrate conceptual understanding and technical skill in current practices of comprehensive health care and management for the following:
    a. Precisely follow effective grooming procedures and techniques for applicable species
    b. Design appropriate facilities based on assessment of needs and present plans in a visual format
    c. Identify appropriate owner/handler responses to behaviors and instincts to ensure safety of both individual and small animal in a variety of situations
    d. Distinguish between clinical signs of proper health and poor health, justifying explanations with data and evidence
    e. Using quantitative reasoning and appropriate units, calculate rations based on animal characteristics (age, weight, breed, activity level) and nutritional needs.
    f. Illustrate the reproductive cycle graphically, and summarize available breeding methods and current reproductive technologies
    g. Research common diseases and parasites and their effects on the health of birds, fish, amphibians, and reptiles, and draw evidence from the most recent medical literature to recommend the best prevention or control measures.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards AS at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Veterinary Science

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5961
Prerequisite(s):	*Large Animal Science* (6116)
Credit:	1
Grade Level:	12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses. In addition, this course satisfies one credit of laboratory science required for graduation.
Programs of Study and Sequence:	This is the fourth and final course in the *Veterinary and Animal Science* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Joshua Bledsoe, Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Stena.Meadows@tn.gov Vacant, Middle Tennessee FFA Consultant Vacant, West Tennessee FFA Consultant
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers are encouraged to use embedded WBL activities. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	OSHA 30-Hour General Industry or Tennessee Specifice Industry Certification (TSIC) for Animal Science
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	(048 and 015), (048 and 016), (048 and 017), (048 and 081), (048 and 126), (048 and 127), (048 and 128), (048 and 129), (048 and 151), (048 and 211), (048 and 212), (048 and 213), (048 and 214), (048 and 414), (048 and 415), (048 and 416), (048 and 417), (048 and 418), (048 and 449), (150 and 015), (150 and 016), (150 and 017), (150 and 081), (150 and 126), (150 and 127), (150 and 128), (150 and 129), (150 and 151), (150 and 211), (150 and 212), (150 and 213), (150 and 214), (150 and 414), (150 and 415), (150 and 416), (150 and 417), (150 and 418), (150 and 449), (448 and 015), (448 and 016), (448 and 017), (448 and 081), (448 and 126), (448 and 127), (448 and 128), (448 and 129), (448 and 151), (448 and 211), (448 and 212), (448 and 213), (448 and 214), (448 and 414), (448 and 415), (448 and 416), (448 and 417), (448 and 418), (448 and 449)

Approved April 10, 2015; Amended April 15, 2016

Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html

Course Description

Veterinary Science is an advanced course in animal science and care for students interested in learning more about becoming a veterinarian, vet tech, vet assistant, or pursuing a variety of scientific, health, or agriculture professions. This course covers principles of health and disease, basic animal care and nursing, clinical and laboratory procedures, and additional industry-related career and leadership knowledge and skills. Upon completion of this course, students will be able to pursue advanced study of veterinary science at a postsecondary institution.

Program of Study Application

This is the fourth and final course in *Veterinary and Animal Sciences* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, & Natural Resources website at https://tn.gov/education/article/cte-cluster-agriculture-food-natural-resources.

Course Standards

Economic, Occupational, and Technological Implications

1) Explore and compare local and regional career opportunities in the veterinary science industry using information from local job postings and Tennessee labor data. Describe in a written or visual representation the knowledge, skills, and abilities necessary for a selected occupation in veterinary science.

2) Examine specific technologies that have evolved within the veterinary science industry including but not limited to advances in equipment, procedures, and healthcare, and evaluate the economic and societal implications of each. Explain in an informative essay how these advances have impacted the veterinary science industry.

Personal and Occupational Health and Safety

3) Compare and contrast the safety hazards associated with clinical and field settings. Review safety hazard case studies and recommend research-based practices to prevent the safety hazard in the future.

4) Review common laboratory safety procedures for tool and equipment operation in the veterinary science laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy.

5) Demonstrate in a live setting or in a presentation the ability to follow procedures precisely for the following areas:
    e. Animal restraint and handling in clinical or field settings
    f. Sanitation, disinfection, and sterilization procedures to prevent transfer of zoonotic diseases
    g. Material safety data sheets (MSDS) interpretation

Veterinary Law and Ethics

6) Gather and compare information from a variety of authoritative sources (such as professional associations or non-profit organizations) on the philosophical, social, moral, and ethical issues encountered in the veterinary profession. Debate their implications for practitioners of veterinary science by developing claim(s) and counterclaim(s) supported by reasoning and evidence from research.

7) Citing specific textual evidence from legislation and news media, summarize local, state, and federal laws that regulate policies and procedures in veterinary medicine pertaining to:
    a. Animal rights and welfare
    b. Professional licensing
    c. Liability of veterinary staff
    d. U.S. Food and Drug Administration (FDA), U.S. Department of Agriculture (USDA), and U.S. Environmental Protection Agency (EPA) regulations for veterinary drugs and biologicals
    e. Occupational Safety and Health Administration (OSHA) regulations for workplace safety

Clinical Anatomy and Physiology

8) Identify common clinical terminology, abbreviations, and symbols relating to the diagnosis, pathology, and treatment of animals.

9) Recognize various states of cellular homeostasis to identify infections, diseases, and mutations.

10) Review fundamental concepts pertaining to tissue and organ systems by comparing and contrasting the structure and function of different tissue types, including epithelial, connective, muscle, and nervous tissues. Summarize in written or presentation format how cellular differentiation allows for specialized tissue development.

11) Identify and research the major body systems, including skeletal, muscular, respiratory, digestive, nervous, integumentary, urinary, and reproductive system. Develop models to compare and contrast between different species of small and large domesticated animals.

Clinical Nutrition

12) Perform nutritional assessment techniques, including body condition scoring and life stage to determine the nutritional status of animals. Apply this information to recommend balanced rations, providing written and oral justification to support recommendations.

13) Research the relationships of diseases and disorders to digestion, absorption, and metabolic processes using case studies, instructional materials, and scholarly journals. Assess the impact of various diseases and disorders on the maintenance of optimum nutrition levels in the body.

Clinical Procedures

14) Correctly identify and describe the function of common equipment used in the clinical area of a veterinary practice, including but not limited to examination tools, radiology equipment, ultrasound equipment, surgical equipment and testing equipment. Develop a checklist including safe use and maintenance for specific equipment.

15) Demonstrate, in a live setting or in a presentation, physical examination procedures in the following areas:
    a. Identification of exam purpose, importance, and routine tasks
    b. Completion of new client health history report
    c. Identification and evaluation of factors affecting the physiological state of animals
    d. Identification of characteristics and signs of healthy animals
    e. Demonstration of procedures to accurately obtain and record vital signs
    f. Identification and evaluation of effects of age, stress, and environmental factors on vital signs

16) Identify and recommend the optimum timeline for administering different types of vaccines suitable for different species. Demonstrate, in a live setting or in a presentation, the ability to:
    a. Identify injection methods
    b. Identify appropriate anatomical injection sites
    c. Administer the injection, including the selection of appropriate equipment

17) Explain the importance of contamination prevention as related to the veterinary industry. Demonstrate, in a live setting or in a presentation, the ability to explain and follow contamination control procedures relating to the following areas:
    a. Principles of sanitation, disinfection, antiseptics, and sterilization
    b. Exam room care and sanitation procedures
    c. Classification of sterilants, antiseptics, disinfectants, and their appropriate applications
    d. Hazardous waste management
    e. Proper techniques to fill a syringe for a prescribed dosage

Animal Nursing

18) Design a plan of care by interpreting patient records and treatment plans, and perform basic nursing and patient monitoring tasks.

19) Outline basic first aid, wound care, and bandaging procedures and compare the different procedures in relation to small and large animals. Demonstrate, in a live setting or in a presentation, the ability to follow these procedures precisely, while distinguishing between small and large animals for the following areas:
    a. Canine cardiopulmonary resuscitation (CPR) procedures
    b. Assessment and care of common physical injuries such as cuts, abrasions, and contusions
    c. Wound therapies at different phases of healing
    d. Types and purposes of bandages, splints, slings, and casts, and indications for use
    e. Techniques for application and removal of bandages
    f. Caring of animals during the birthing process

20) Research and explain laws and regulations related to the administration of prescription and over-the-counter medication within the veterinary industry to develop a customer fact sheet for common medicines, citing specific text from legislation. Demonstrate, in a live setting or in a presentation, the ability to follow medication administration procedures precisely, including:
    a. Identification of common medications and their required storage, handling, and disposal
    b. Demonstration of administration techniques for topical and oral medications
    c. Interpretation of medication label and packaging information
    d. Calculate proper dosages of medications based upon label directions

Laboratory Procedures

21) Compare and contrast appropriate laboratory quality control procedures such as the proper collection, preparation, handling, and storage of biological samples, and describe their effects on obtaining accurate data from laboratory procedures.

22) Develop a procedural check sheet to aid in conducting veterinary clinical hematology procedures such as complete blood count (CBC). Using the check sheet, demonstrate, in a live setting or in a presentation, the ability to follow clinical hematology procedures precisely in relation to the following areas:
    a. Sample collection, preparation, and storage
    b. Microscopic examination to identify blood cells
    c. Interpretation of normal and abnormal results

23) Explain and justify the need for conducting urinalysis and fecal analysis as related to animal health. Outline procedures for conducting clinical urinalysis to include the following:
    a. Sample collection, preparation, and storage
    b. Physical, chemical, and microscopic examination procedures
    c. Interpretation of normal and abnormal results

Principles of Disease

24) Compare and contrast the role of the USDA, state veterinarians, state animal disease laws, and diagnostic labs in disease prevention and control. Explain the classification of diseases

and disease processes, and identify causative factors and agents of disease in a graphical illustration or written analysis.

25) Explain how diseases affect the body and differentiate between clinical signs and symptoms of disease. Identify and describe the differences between clinical signs and symptoms of proper health and poor health.

26) Identify symptoms of common animal diseases and their causative agents, and summarize methods of prevention, treatment, and control by drawing evidence from informational texts or recent medical literature.

27) Describe the clinical signs of an animal with a parasite infection. Compare and contrast the symptoms of common internal and external parasite infections and summarize methods of prevention, treatment, and control between small and large animals.

28) Research how genomics can be used to reduce animal diseases, citing credible sources. Compare the different approaches genomics have on disease tolerance in both small and large animals.

Clinic Management

29) Demonstrate effective oral and written communication skills needed in clinical settings, including but not limited to client greeting, telephone answering, appointment scheduling and management, and admission and discharge procedures. Outline the procedures for euthanasia and post mortem customer care and role-play appropriate grief counseling services for clients.

30) Identify the types of medical and financial records required to ensure a viable veterinary practice. Explain, justify, and demonstrate correct procedures for the completion and filing of veterinary records, required business operational records including inventory management documents, and related documentation in a legal manner to ensure a sound business.

Standards Alignment Notes

References to other standards include:

- SAE: Supervised Agricultural Experience: All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.

- AFNR: National Agriculture, Food, & Natural Resources (AFNR) Career Cluster Content Standards: Students engaged in activities outlined above should be able to demonstrate fluency in Standards AS.01, AS.02, AS.03, AS.04, and AS.06 at the conclusion of the course.

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Early Childhood Education Careers I (ECEC I)

Primary Career Cluster:	Education and Training
Program Manager:	Elizabeth Rafferty, (615) 532-2840, Elizabeth.Rafferty@tn.gov
Course Code(s):	6015
Prerequisite(s):	None
Credit:	1
Grade Level:	9
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Education and Training courses.
Programs of Study and Sequence:	This is the first course in the *Early Childhood Education Careers* program of study.
Aligned Student Organization(s):	Family, Career and Community Leaders of America (FCCLA): http://www.tennesseefccla.org/ Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov SkillsUSA: http://tnskillsusa.com/ Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	(050 and 058), (050 and 451), (051 and 058), (051 and 451), (154 and 156), (450 and 058), (450 and 451)
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html

Course Description

Early Childhood Education Careers I (ECEC I) is a foundational course in the Education and Training career cluster intended to prepare students for careers as preschool teachers, elementary teachers,

childcare providers, nannies, and more. Course content covers the foundation of childhood development services, careers, provider responsibilities and aptitudes, and fundamentals of child development. Upon completion of this course, students will have created artifacts for inclusion in a course portfolio, which will continue with them throughout the program of study.

Program of Study Application

This is the foundational course in the *Early Childhood Education Careers* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Education and Training website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html.

Course Standards

Safety and Confidentiality

1) Compile and critique procedures for maintaining a safe and healthy learning environment for children present in a childcare facility. Cite information for the Occupational Safety and Health Administration (OSHA), including but not limited to CPR, First-Aid, and Bloodborne Pathogens, to identify precautionary guidelines to prevent illness, communicable diseases and injuries. Incorporate safety procedures and complete safety test with 100 percent accuracy.

2) Recognize the signs of child abuse, and research the legal requirements for reporting suspected abuse. Prepare an informative text or presentation describing types of abuse, including signs and symptoms to look for, and outline the reporting requirements and procedures.

3) Research state and national child care confidentiality laws. Describe and demonstrate the importance of confidentiality. Use case studies and practicum experiences to recognize and report situations that warrant a breach of confidentiality.

Foundations of Early Childhood Services

4) Cite specific textual evidence to compare and contrast various types of early childhood care services in a graphic organizer, chart, or table. Include information about relevant regulations and licensure requirements. Example programs/providers include, but are not limited to:
    a. Child care centers
    b. Head Start
    c. Kindergarten—4th grade
    d. Laboratory schools
    e. Montessori
    f. Preschool
    g. Nannies

5) Create an annotated graphic illustrating the stages of human development from birth through age eight and the corresponding activities that support physical, emotional, social, and intellectual development at each stage.

6) Research and summarize the influences of major educational theorists' philosophies and how the theory supports the need for early childhood services. Evaluate the extent to which the reasoning and evidence presented by the theorists supported their claims. Create an annotated timeline to note the differences in the theoretical philosophies. Examples of theorists include:
    a. John Dewey
    b. Friedrich Froebel
    c. John Locke
    d. Abraham Maslow
    e. Maria Montessori
    f. Jean Piaget
    g. Lev Vygotsky

7) Explore and summarize historical information and the development and expansion of early childhood education. Use multiple resources and references, such as, but not limited to the National Association for the Education of Young Children (NAEYC), Head Start, theories of teaching, and foundational philosophies of early childhood education.

Childhood Development Careers

8) Use local job postings and national labor and workforce data to identify and describe essential knowledge and skills for careers within the childcare field. Complete one or more career interest surveys, analyze the results, and write a summary of the results. Compare the survey results with earlier research findings on essential knowledge and skills for providers.

9) Compile and analyze real-time labor market data, including economic and demographic trends, and compare with authentic vacancy announcements on local and national job boards. Use this information to compare and contrast occupations by education requirements, job availability, salaries, and benefits.

Provider Responsibilities and Aptitudes

10) Identify daily tasks of child development service careers (e.g., owner, director, assistant director, cook, teacher, substitute teacher, teacher aid, provider, etc.) through observation, first-hand experience, or online research. Describe each of the tasks and estimate the time spent on each category of task. Write clear narratives exploring multiple facets of common early childhood career activities, including but not limited to:
    a. Planning effective instruction
    b. Meeting the physical needs of children
    c. Supervising children
    d. Non-instructional activities (such as parent communication, site maintenance, etc.)

11) Research professional ethical standards from recognized professional organizations, such as the National Association for the Education of Young Children (NAEYC) and the Association for Early Learning Leaders. Synthesize principles from the standards to create a personal code of ethics.

12) Describe personal characteristics and aptitudes, including 21st century skills, needed by childcare providers. Create a rubric for self-assessing 21st century skills, such as the ability to:
    a. Communicate verbally and nonverbally in a respectful manner with children, parents, and colleagues
    b. Work effectively in teams and resolve conflicts when necessary
    c. Demonstrate a positive work ethic
    d. Understand different cultural perspectives and their impact in the classroom;
    e. Use instructional technology appropriately
    f. Adapt to changes
    g. Manage time and resources wisely

13) Use the self-assessment rubric created during this course to establish a baseline evaluation of 21st century skills, attitudes, and work habits. Working from the baseline, create a growth plan promoting advancement of skills and abilities to place in the career portfolio.

Introduction to Child Development

14) Create an annotated model or graphic illustration to describe the parts and functions of the human brain. Create a brain development timeline from birth through age eight.

15) Draw conclusions about the most important influences on and relationships between brain development, reasoning capacity, and learning. Define brain plasticity and describe how it changes over the lifespan. Brain anatomy for research includes: frontal, parietal, occipital, and temporal lobes; brain stem, cerebellum, cerebral cortex, and limbic system.

16) Using relevant information from multiple print and electronic resources, compare and contrast the “ages and stages” identified by influential child development theorists. Formulate a hypothesis about child development and cite textual evidence. Examples of child development theories include, but are not limited to:
    a. Erikson's psychosocial stage theory
    b. Kohlberg's moral understanding stage theory
    c. Piaget's cognitive development stage theory
    d. Bronfenbrenner's ecological systems theory

17) Analyze the factors that contribute to personality, and investigate several research-based personality assessment tools. Use textual evidence to support the analysis. Reflect on the connections between personality, life experience, environment, and brain development.

18) Examine the Tennessee Early Childhood Education Early Learning Developmental Standards. Summarize the major developmental milestones and create a graphic illustrating the continuum of development from birth through age five in these domains:
    a. Speech and Language Development

b. Early Literacy
c. Math and Science
d. Social Studies
e. Creative Arts
f. Social and Emotional Development
g. Physical Development

19) Research observation and assessment methods used to observe and interpret children's growth and development. Identify risk factors, delays, or disabilities that may indicate a need for special services.

Introduction to Learning

20) Analyze NAEYC's *12 Principles of Child Development and Learning* and additional relevant documents to explain how the principles serve as the foundation for implementing developmentally appropriate practices (DAP) that promote young children's optimal learning.

21) Synthesize academic research to describe and critique major approaches to theories of human learning:
    a. Behaviorism
    b. Cognitive psychology
    c. Social learning theory
    d. Constructivism
    e. Experiential learning
    f. Multiple intelligences

    Write an argumentative essay that develops a claim about how a major educational theory of learning has impacted modern practice of supervising or instructing young children.

22) Compare and contrast research on the influence of the following factors on student self-concept and learning:
    a. Student experiences, interests, aptitudes
    b. Family and culture
    c. Teacher/Caregiver behavior and attitudes
    d. Peers

Career Investigation

23) Create a course portfolio, using writing and visual elements to connect personal career preparation artifacts to concepts learned in this course.

24) Investigate early childhood education career options to create a written or electronic career pathway plan that outlines academic and career achievement goals. Create a timeline for ongoing reflection throughout the program of study coursework.
    a. Identify dual credit courses available within specific programs of study
    b. Gather information from postsecondary institution websites and compare community college, Tennessee Colleges of Applied Technology, and university education programs that align with secondary programs of study

25) Drawing upon content in this course, write a clear and coherent definition of a *teaching philosophy*, argue its significance to student learning, and create a personal teaching philosophy for inclusion in the professional portfolio.

The following artifacts will reside in the student's portfolio:

- Foundations of Human Development artifacts
- Career and Interest Survey artifacts
- 21st Century Skills Rubric
- Brain artifacts and model
- Child Development Theorist research
- Human Development narrative
- Career Cluster Pathway Plan artifact
- Personal Teaching Philosophy

Standards Alignment Notes

*References to other standards include:

- FACS: National Standards for Family and Consumer Sciences Education, Second Edition: National Association of State Administrators of Family and Consumer Sciences, FACS.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Early Childhood Education Careers II (ECEC II)

Primary Career Cluster:	Education and Training
Program Manager:	Elizabeth Rafferty, (615) 532-2840, Elizabeth.Rafferty@tn.gov
Course Code(s):	6016
Prerequisite(s):	*Early Childhood Education Careers I* (6015)
Credit:	1
Grade Level:	10
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Education and Training courses.
Programs of Study and Sequence:	This is the second course in the *Early Childhood Education Careers* program of study.
Aligned Student Organization(s):	Family, Career and Community Leaders of America (FCCLA): http://www.tennesseefccla.org/ Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov SkillsUSA: http://tnskillsusa.com/ Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	(050 and 058), (050 and 451), (051 and 058), (051 and 451), (154 and 156), (450 and 058), (450 and 451)
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html

Course Description

Early Childhood Education Careers II (ECEC II) is an intermediate course for students interested in learning more about becoming an early childhood teacher, elementary teacher, nanny, or childcare provider. This course covers the components of curriculum planning, learning, screening and

assessing, special populations, and educational technology. Students will observe educators in action, practice specific skills, and add personal work products to a course portfolio. During this course, students working toward earning a Child Development Associate (CDA) credential should begin recording hours toward the required 480 clock hours needed in working with children. Upon completion of this course, proficient students will be able to pursue more advanced coursework in the ECEC program of study.

Program of Study Application

This is the second course in the *Early Childhood Education Careers* program of study. For more information on the benefits and requirements of implementing these programs in full, please visit the respective career cluster websites at https://tn.gov/education/article/cte-cluster-education-training.

Course Standards

Safety

1) Compile and critique procedures for maintaining a safe and healthy learning environment for children present in a childcare facility. Cite information for the Occupational Safety and Health Administration (OSHA), including but not limited to CPR, First-Aid, and Bloodborne Pathogens, to identify precautionary guidelines to prevent illness, communicable diseases and injuries. Incorporate safety procedures and complete safety test with 100 percent accuracy.

2) Recognize the signs of child abuse, and research the legal requirements for reporting suspected abuse. Prepare an informative text or presentation describing types of abuse, including signs and symptoms to look for, and outline the reporting requirements and procedures.

3) Evaluate research and define adverse childhood experiences (ACEs). Summarize and write narratives on state and national goals that address ACEs.

Curriculum and Activity Planning Foundations

4) Research and analyze informational texts to identify components of developmentally appropriate instruction for children from birth through age eight. Compare and contrast components of curriculum planning models, including but not limited to the following:
    a. Bank Street developmental-interaction approach
    b. Dodge creative curriculum for preschool
    c. High/Scope curriculum
    d. Kamii-DeVries constructivist approach
    e. Montessori method
    f. Direct instruction mode

5) Research the characteristics of the stages of play development. Draw conclusions about the relationship between play, child development, and learning. Synthesize the research to write recommendations for developmentally appropriate time, structure, materials, and equipment for play within an early childhood care program.

6) Citing specific textual evidence found in academic journals or research, defend the need for the preparation of a comprehensive curriculum for children from birth through age eight. Address the developmental significance of including the following in a curriculum:
    a. Music
    b. Art
    c. Role-play/Pretend Play
    d. Reading
    e. Storytelling
    f. Outdoor excursions
    g. Games

7) Investigate relevant national and state curriculum standards, and explain how they help guide teaching in order to affect learning.

8) Conduct a research project on lesson planning in all early childhood learning levels. Identify the typical components of lesson planning documents and create a lesson plan template that incorporates components such as:
    a. Content-area Tennessee Academic Standards and 21st Century Skills standards
    b. Student learning objectives aligned to standards
    c. Materials and equipment needed
    d. Instructional activities
    e. Pacing chart
    f. Accommodations for special needs students
    g. Closure/reflection
    h. Assessment

Learning

9) Using academic journals and news articles, investigate how social, cultural, and economic factors inside and outside of the classroom influence student learning and student behavior. Assess the extent to which reasoning and evidence support the author's claim, citing specific textual evidence.

10) Compare and contrast a range of learning styles identified in relevant education research. Synthesize information about the characteristics of each learning style, such as examples of teaching methods, and assignments in an informative text, graphic organizer, or other illustration. Learning styles include:
    a. Visual/Spatial Learners
    b. Auditory/Verbal/Linguistic Learners
    c. Analytic Learners
    d. Kinesthetic or Tactile Learners
    e. Global Learners

11) Drawing evidence from academic research, create a rubric for evaluating and selecting developmentally appropriate books, materials, toys, and technology resources by age. Examples of criteria to be analyzed include but are not limited to,:
    a. Age and developmental level
    b. Safety
    c. Visual and tactile appeal
    d. Promotion of learning through play, exploration, or interaction
    e. Adaptability for differently-abled children
    f. Durability
    g. Non-stereotyped representation of groups from different cultures or ethnic backgrounds

Screening and Assessment

12) Differentiate between child screening, assessment, and evaluation. Collect firsthand data through interviews with local child care providers to identify the most common assessment processes used. Citing specific textual evidence, describe the purpose and procedures associated with common types of assessments, including:
    a. Continuous
    b. Developmental
    c. Diagnostic
    d. Family
    e. Multidisciplinary
    f. Play-based
    g. Readiness

13) Prepare a narrative to demonstrate understanding of the role of the provider in screening infants and children. Prepare a graphic that includes expected developmental milestones that can be used for screening and reference. Create a checklist of activities that a provider can use with children from birth to age eight to screen for achievement of significant developmental milestones.

14) Create a list and define current assessment tools used to evaluate children's development. Compare and contrast the instruments currently available to assess what children know, understand, and are able to do within the physical, social, emotional, and cognitive development domains (e.g., Ages and Stages Questionnaire, Checklist for Autism in Toddlers, etc.).

Special Populations

15) Research the Individuals with Disabilities Education Act (IDEA), Section 504 of the Rehabilitation Act of 1973 and Americans with Disabilities Act (ADA). Summarize the broad categories that IDEA identifies as disabilities and describe general eligibility requirements. Write an analysis of the impact of this legislation on the education of students with special needs.

16) Investigate the roles of parents, teachers, and administrators at an Admission, Review and Dismissal (ARD) meeting and create a visual representation of the ARD process. Examine examples of authentic individualized education programs (IEPs) designed to address the needs of children with disabilities and analyze how the required adaptations and accommodations vary from standard developmentally appropriate practices.

17) Draw evidence from informational texts to define special populations and write a narrative describing the characteristics of special needs children and accommodations recommended for those who have:
    a. Intellectual and developmental disabilities
    b. Emotional or behavioral disorders
    c. Communications disorders, deafness, and hearing loss
    d. Blindness and low vision
    e. Physical disabilities
    f. Gifted and talented designation

    Write recommendations for working with parents when a developmental delay is suspected.

Educational Technology

18) Drawing evidence from research, develop a logical argument to support how technology can enhance or inhibit the development and learning processes of children from birth to age eight. Create a graphic illustrating developmentally appropriate technology through the ages and stages.

19) Research the Children's Internet Protection Act (CIPA) from the Federal Communication Commission (FCC) and other informational texts on internet safety for students. Synthesize the research to create acceptable-use policies for students that are appropriate at different developmental milestones.

Final Project

20) Create a portfolio synthesizing concepts learned in ECEC I and ECEC II. Perform guided observations at the preschool and elementary levels to identify characteristics of an effective classroom and teacher. Write an essay reflecting on the observation experience and revise written career goals and a personal teaching philosophy (developed in ECEC I). Update the print or electronic portfolio, including writing and visual elements to connect observations from the final project to concepts learned in this course.

The following artifacts will reside in the student's portfolio:

- Revised career pathway plan and timeline for achieving academic and career goals
- Revised personal teaching philosophy
- Reflection essay based on observations from the final project

Standards Alignment Notes

*References to other standards include:

- FACS: National Standards for Family and Consumer Sciences Education, Second Edition: National Association of State Administrators of Family and Consumer Sciences, FACS.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Early Childhood Education Careers III (ECEC III)

Primary Career Cluster:	Education and Training
Program Manager:	Elizabeth Rafferty, (615) 532-2840, Elizabeth.Rafferty@tn.gov
Course Code(s):	6017
Prerequisite(s):	*Early Childhood Education Careers II* (6016)
Credit:	1
Grade Level:	11
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Education and Training courses.
Programs of Study and Sequence:	This is the third course in the *Early Childhood Education Careers* program of study.
Aligned Student Organization(s):	Family, Career and Community Leaders of America (FCCLA): http://www.tennesseefccla.org/ Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov SkillsUSA: http://tnskillsusa.com/ Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers who hold an active WBL certificate may offer placement for credit when the requirements of the state board's WBL Framework and the Department's WBL Policy Guide are met. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	Child Development Associate (CDA)
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	(050 and 058), (050 and 451), (051 and 058), (051 and 451), (154 and 156), (450 and 058), (450 and 451)
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html

Approved April 10, 2015; Amended April 15, 2016

Course Description

Early Childhood Education Careers III (ECEC III) is an applied-knowledge course for students interested in becoming an early childhood teacher, elementary teacher, nanny, or childcare provider. This course covers the components of the learning environment, planning age appropriate activities, using activities for learning, and developing communication skills. If available, students may participate in a work-based learning component of instruction and add work products to a course portfolio. Students continuing to work toward earning a Child Development Associate (CDA) credential should record hours toward the required 480—clock hours needed in working with children. Upon completion of this course, proficient students will be prepared to participate in the capstone *ECEC IV* course and/or continue their studies at the postsecondary level.

Work-Based Learning Framework

Standards outlined below may take the form of work-based learning (WBL) opportunities (such as internships, cooperative education, service learning, and job shadowing) or industry-driven project-based learning. These experiences shall comply with the Work-Based Learning Framework guidelines established in SBE High School Policy 2.103. As such, this course shall be taught by a teacher with an active WBL Certificate issued by the Tennessee Department of Education and follow policies outlined in the Work-Based Learning Policy Guide available online at https://www.tn.gov/education/career-and-technical-education/work-based-learning.html. The Tennessee Department of Education provides a Personalized Learning Plan template to ensure compliance with the Work-Based Learning Framework, state and federal Child Labor Law, and Tennessee Department of Education policies, which shall be used for students participating in WBL opportunities.

Program of Study Application

This is the third course in the *Early Childhood Education Careers* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Education and Training website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html.

Course Standards

Safety

1) Compile and critique procedures for maintaining a safe and healthy learning environment for children present in a childcare facility. Cite information for the Occupational Safety and Health Administration (OSHA), including but not limited to CPR, First-Aid, and Bloodborne Pathogens, to identify precautionary guidelines to prevent illness, communicable diseases and injuries. Incorporate safety procedures and complete safety test with 100 percent accuracy.

2) Recognize the signs of child abuse, and research the legal requirements for reporting suspected abuse. Prepare an informative text or presentation describing types of abuse, including signs and symptoms to look for, and outline the reporting requirements and procedures.

3) Conduct a research project examining relevant academic journal articles and news media coverage of adverse childhood experiences (ACEs). Using confidentiality and ethical principles,

supplement research with interviews and other primary sources to provide data and evidence for ACEs.

Managing the Environment

4) Drawing on evidence from informational texts, create a rubric for evaluating the establishment of a positive early childhood environment, including indicators such as visual appearance of the environment, playground equipment safety, child engagement, and provider interaction with children and their parents/guardians.

5) Interview educators to review the results of a site's most recent evaluation under current state regulations, which rates child care facilities based on:
    a. Director qualifications (for child care centers)
    b. Professional development
    c. Developmental learning
    d. Parent/family involvement
    e. Ratio and group size (for child care centers)
    f. Business managements (for family and group child care homes)
    g. Staff compensation (for child care centers)
    h. Program assessment

6) Research the correlation between an effective physical layout (including the use of learning centers for a variety of activities) and effective care environment management. Compare the use of furniture and space in several environments and analyze their compliance with research-based recommendations for layout and with specified legal requirements, including health and safety guidelines.

7) Interview educators and/or providers and create a checklist for performing classroom procedures and for responding to emergency situations, including but not limited to recognizing possible child welfare issues, following fire drills and other natural disaster protocols, and responding to intruder alerts.

8) Research common reasons for misbehavior in children aged two to eight and cite evidence to support development of a written behavior policy to share with parents. From this information, create a graphic illustration demonstrating expected positive behaviors and the appropriate rewards/consequences for use with children to guide behavior at each age level.

9) Analyze cases of challenging classroom behavior. Write a narrative describing the consequences of these behaviors and compare them to the personal code of ethics developed in ECEC I.

10) Research positive classroom management tools that are used to help with misbehavior. Create a tool that could be used in a preschool classroom.

11) Citing specific textual evidence from research on the developmental stages of children, plan and implement (as part of the final project) a schedule for each age from birth to age eight

that incorporates the appropriate amounts of physical activity and quiet time; individual, small group, and large group experiences; and child-initiated and adult-led activities.

12) Discuss and illustrate modifications to the physical environment to accommodate students with disabilities.

Caring for Young Children

13) Research and synthesize informational texts to determine the characteristics of communicable childhood diseases. Compare and contrast via a table, chart, or graphic annotated with:
    a. Name
    b. Disease Symptoms
    c. Transmission methods
    d. Incubation period
    e. Prevention strategies
    f. Required immunizations (Tennessee Department of Health Rule 1200-14-1-.29)
    g. Decision tree or flow chart for admitting sick child

14) Identify, practice, and demonstrate appropriate procedures for meeting developmentally appropriate physical needs of children, including but not limited to:
    a. Hygiene
    b. Rest
    c. Safety
    d. Hydration and nutrition
    e. Appropriate dress
    f. First-aid and CPR

Planning Developmentally Appropriate Learning Activities

15) Create a journal that outlines and discusses learning experiences. Organize and provide examples of developmentally appropriate learning activities. Develop a Child Development Associate (CDA) manual and include all required components, including experiences and activities.

16) Demonstrate knowledge of the relationship between subject areas (such as music, language, etc.) to stimulate growth in specific developmental domains. Develop lesson plans that incorporate the typical components of lesson planning documents and create a template that incorporates components such as:
    i. Learner developmental level/age
    j. Developmental domains addressed
    k. Subject area
    l. Materials and equipment needed
    m. Learner grouping (one-on-one, small group, large group)
    n. Instructional activities
    o. Schedule (daily, weekly, monthly)
    p. Accommodations for special needs students

q. Closure/reflection
r. Assessment

17) Create and perform activities to screen for achievement of significant developmental milestones with children from birth to age eight, using the checklist of activities created in ECEC II.

18) Using instructional materials and academic research, analyze individual and group teaching strategies. Create an effective, academic lesson using the materials and research. Cite evidence to support strategies used to promote learning.

Communication Skills (21st Century Skills)

19) Identify best practices for encouraging parental involvement and write clear and coherent instructions for informing parents about the educational philosophy of the center, goals for the child's development, instructional approach, and desire for ongoing communication about the parent-provider education partnership.

20) Demonstrate effective communication and interaction with children, including but not limited to:
    a. Active listening
    b. Open-ended questioning
    c. One-on-one conversations
    d. Group discussions (e.g., circle time)
    e. Modeling appropriate grammar and vocabulary for the context
    f. Acknowledging and addressing emotions
    g. Practicum experiences journal listed in ECEC III Standard 14.

Final Project

21) Apply knowledge from this course and document the final project in the course portfolio. Demonstration of knowledge includes but is not limited to:
    a. Performing simple activities to check developmental milestone attainment
    b. Maintaining children's records
    c. Using a lesson plan template to create daily activities (created in this course) and implement them with small groups, using developmentally-appropriate teaching strategies
    d. Arranging learning centers that provide for children's exploration, discovery, and development
    e. Selecting and using multiple resources and teaching methods
    f. Creating a classroom floor plan designed to provide equitable access and maximize learning for all students
    g. Evaluating student levels to adapt lessons for differentiated instruction, as needed
    h. Establishing a positive classroom climate
    i. Creating opportunities for positive communication with families

The following artifacts will reside in the student's portfolio:

- Early Childhood Environment Rubric
- Health and Safety document
- Classroom Procedure Checklist
- Communicable Disease artifacts
- Developmentally Appropriate Learning Rubric
- Teaching Strategies graphic
- Communication artifacts
- Behavior Graphic illustration
- Revised Career and Professional Growth Plan
- Sample Child's Work

Standards Alignment Notes

*References to other standards include:

- FACS: National Standards for Family and Consumer Sciences Education, Second Edition: National Association of State Administrators of Family and Consumer Sciences, FACS.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Early Childhood Education Careers IV (ECEC IV)

Primary Career Cluster:	Education and Training
Program Manager:	Elizabeth Rafferty, (615) 532-2840, Elizabeth.Rafferty@tn.gov
Course Code(s):	6135
Prerequisite(s):	*Early Childhood Education Careers III* (6017)
Credit:	1
Grade Level:	12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus if taken in conjunction with other Education and Training courses.
Programs of Study and Sequence:	This is the capstone course in the *Early Childhood Education Careers* program of study.
Aligned Student Organization(s):	Family, Career and Community Leaders of America (FCCLA): http://www.tennesseefccla.org/ Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov SkillsUSA: http://tnskillsusa.com/ Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers who hold an active WBL certificate may offer placement for credit when the requirements of the state board's WBL Framework and the Department's WBL Policy Guide are met. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	Child Development Associate (CDA)
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	(050 and 058), (050 and 451), (051 and 058), (051 and 451), (154 and 156), (450 and 058), (450 and 451)
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html

Approved April 10, 2015; Amended April 15, 2016

Course Description

Early Childhood Education Careers IV (ECEC IV) is capstone course for students who intend to pursue advanced training as an early childhood teacher, elementary teacher, nanny, or childcare provider. The course standards cover understanding of the components of professionalism, policies, regulations, and teaching and learning. Students will participate in a work-based learning component of instruction and add work products to a course portfolio. Students continuing to work toward earning a Child Development Associate (CDA) credential should record hours toward the required 480—clock hours needed in working with children. Upon completion of this course, proficient students will be prepared to continue their studies at the postsecondary level.

Work-Based Learning Framework

Internship standards outlined below may take the form of work-based learning (WBL) opportunities (such as internships, cooperative education, service learning, and job shadowing) or industry-driven project-based learning. These experiences shall comply with the Work-Based Learning Framework guidelines established in SBE High School Policy 2.103. As such, this course shall be taught by a teacher with an active WBL Certificate issued by the Tennessee Department of Education and follow policies outlined in the Work-Based Learning Policy Guide available online at https://www.tn.gov/education/career-and-technical-education/work-based-learning.html. The Tennessee Department of Education provides a Personalized Learning Plan template to ensure compliance with the Work-Based Learning Framework, state and federal Child Labor Law, and Tennessee Department of Education policies, which shall be used for students participating in WBL opportunities.

Program of Study Application

This is the capstone course in the *Early Childhood Education Careers* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Education and Training website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html.

Course Requirements

This capstone course aligns with the requirements of the Work-Based Learning Framework (established in Tennessee State Board High School Policy), with the Tennessee Department of Education's Work-Based Learning Policy Guide, and with state and federal Child Labor Law. As such, the following components are course requirements:

Course Standards

1) A student will have a Personalized Learning Plan that identifies their long-term goals, demonstrates how the Work-Based Learning (WBL) experience aligns with their elective focus and/or high school plan of study, addresses how the student plans to meet and demonstrate the course standards, and addresses employability skill attainment in the following areas:
    a. Application of academic and technical knowledge and skills (embedded in course standards)
    b. Career knowledge and navigation skills
    c. 21st Century learning and innovation skills
    d. Personal and social skills

Safety

2) Compile and critique procedures for maintaining a safe and healthy learning environment for children present in a childcare facility. Cite information for the Occupational Safety and Health Administration (OSHA), including but not limited to CPR, First-Aid, and Bloodborne Pathogens, to identify precautionary guidelines to prevent illness, communicable diseases and injuries. Incorporate safety procedures and complete safety test with 100 percent accuracy.

3) Recognize the signs of child abuse, and research the legal requirements for reporting suspected abuse. Prepare an informative text or presentation describing types of abuse, including signs and symptoms to look for, and outline the reporting requirements and procedures.

4) Using the adverse childhood experiences (ACEs) narratives written in ECEC II and new cited research, create a presentation for an in-school professional development training that could be used to promote the importance of the evaluation and recognition of ACEs in early childhood and other stages of life.

Professionalism and 21st Century Skills

5) Demonstrate the following professional attributes and add to the professionalism rubric created in ECEC I and write performance indicators for each:
    a. Attendance/punctuality
    b. Professional dress and behavior
    c. Positive attitude
    d. Collaboration
    e. Honesty
    f. Respect
    g. Responsibility
    h. Appropriate technology use
    i. Reflective teaching practice.

6) Interview internship supervisor to determine the child care *program philosophy*. Research and gather diverse program philosophies from a variety of care situations and write a narrative comparing and contrasting them with the internship program philosophy.

7) Analyze case studies of child care professionals' reactions to children in both positive and negative situations. Write a narrative describing the consequences of provider behaviors and compare them to the personal code of ethics and professionalism rubric indicators.

   Research the relationship between early childhood education and a student's future success. Gather research from academic journals and news articles and craft an argumentative essay with specific textual evidence.

Policies

8) Access electronic resources related to the Tennessee Licensure Rules for Child Care Centers to identify the provider regulations for licensure and operation. Summarize the requirements and create tracking tools for documenting legal compliance. Topics for investigation include, but are not limited to:
    a. Application for and maintenance of licensure
    b. Ownership and organizational structure
    c. Insurance
    d. Required parental communication
    e. Record keeping
    f. Adult-child ratios
    g. Indoor and outdoor play equipment
    h. Educational activities
    i. Technology use
    j. Health and safety

9) Research and cite the procedure for documenting and reporting child welfare concerns. Analyze a case study and assess the extent to which the proposed resolution of the case is appropriate.

10) Drawing upon state regulations, develop procedures for releasing children (such as list of authorized persons; photo ID) and create parent documentation forms for medical information (such as food allergies, known disabilities, permission to administer medicine) and emergency contact information.

Career Requirements

11) Gather relevant information from multiple print and digital resources (such as job postings and promotional materials) to prepare a document or graphic comparing the entry-level qualifications for caregivers, assistant directors, and directors of child care centers. Evaluate the impact of postsecondary training and describe the benefits of participation in a professional early childhood organization, such as the National Association for the Education of Young Children (NAEYC). Revise the career pathway plan outlining academic and career achievement goals and timeline developed in ECEC I to reflect opportunities for advancement in the field.

12) Review case studies in education to argue the need for background checks—fingerprinting, drug testing, and checking professional references—and a professional code of conduct for providers and volunteers.

13) Working in teams, use resources such as those available from the U.S. Small Business Administration to identify the components of a business plan. Create a hypothetical child care center and write a description of the business, its mission statement and an analysis of the market for its services.

Teaching and Learning

14) Use a lesson plan template (created in ECEC III) to create daily activities within themed units of instruction for implementation with children ages one to eight. Where appropriate, align the activities with NAEYC's effective developmentally appropriate teaching strategies:
    a. Acknowledge what children do or say
    b. Encourage persistence and effort
    c. Give specific feedback rather than general comments
    d. Model attitudes, problem-solving, and behavior toward others
    e. Demonstrate the correct way to do something
    f. Add challenges that promote cognitive development
    g. Ask questions that provoke children's thinking
    h. Give assistance (such as cues or hints)
    i. Provide information directly
    j. Give directions for children's action or behavior

15) Use the rubric (created in ECEC III) for evaluating and selecting developmentally appropriate books, materials, toys, and technology resources.

16) Create developmentally appropriate, visually appealing instructional materials and resources, as well as electronic media (if available), to accompany lesson facilitation during the internship.

17) Demonstrate effective verbal, non-verbal, written, and electronic communication. Create a draft agenda for parent conferences. Using parent conference simulations, role-play or write narratives of possible outcomes for parent reactions to both childhood behavior and developmental situations (e.g., bullying, inattention, hyperactivity, giftedness, vision or hearing impairment, delayed speech, object or color identification, social skill issues, etc.).

18) Research language acquisition and use by children from ages one to eight, using academic journals and case studies. Write a narrative to demonstrate understanding of teaching strategies that promote development of complex language skills.

19) Draw evidence from informational texts to develop lesson activity adaptations for inclusion of children with fine motor, gross motor, cognitive, social/emotional, and self-help/adaptive special needs.

Internship

20) Apply knowledge from this and preceding ECEC courses to document the internship in the course portfolio. Demonstration of knowledge includes but is not limited to:
    j. Performing simple activities to check developmental milestone attainment
    k. Maintaining children's records
    l. Using a lesson plan template to create daily activities within themed units of instruction for implementation with children ages one to eight using developmentally-appropriate teaching strategies
    m. Using the behavior management chart (created in ECE III)

n. Arranging learning centers that provide for children's exploration, discovery, and development
o. Selecting and using multiple resources and teaching methods
p. Creating new instructional materials
q. Creating a classroom floor plan designed to provide equitable access and maximize learning for all students
r. Evaluating student levels to adapt lessons for differentiated instruction, as needed
s. Establishing a positive classroom climate
t. Creating opportunities for positive communication with families

21) Collaboratively, create a rubric that will be used by observers to evaluate preparation for the internship, implementation of lesson plans, and professionalism.

22) During the internship, implement lesson plans developed in this course and carry out daily childcare routines, such as meals, naps, personal hygiene and exercise. Annotate lesson plans and work products to document lessons learned.

23) Create and continually update a personal journal to document the internship. Draw connections between the experience and course content, thoughtfully reflecting on:
    a. Tasks accomplished and activities implemented
    b. Lesson effectiveness
    c. Positive and negative aspects of the experience
    d. Self-assessment and plans for refining instructional practice
    e. Interactions with children, families, providers and other staff
    f. Personal satisfaction

24) Upon conclusion of the internship, write a clear and coherent reflection paper containing a revised personal teaching philosophy and career growth plan based on the teaching journal. Produce a technology-enhanced class presentation showcasing highlights, challenges, and lessons learned from the internship.

The following artifacts will reside in the student's portfolio:

- Revised professionalism rubric
- Revised statement of personal teaching philosophy
- Revised personal code of professional ethics
- Revised career and professional growth plan
- A description of the internship setting, children, and a contract or list of interning student responsibilities
- Lesson plans, assignments, developmental assessment activities and instructional materials created
- Examples of visual material incorporated (e.g. graphics, presentation slides, videos, demonstrations) into lessons
- Description of instructional technology used, with examples if appropriate
- Daily teaching journal reflecting on tasks and activities, lesson effectiveness, positive and negative aspects of the experience, self-assessment, plans for refining instructional practice, and interactions with students, families, teachers and staff
- Feedback from supervising teacher at site and from ECEC IV teacher based on observations

- Sample child's work product

Standards Alignment Notes

*References to other standards include:

- FACS: National Standards for Family and Consumer Sciences Education, Second Edition: National Association of State Administrators of Family and Consumer Sciences, FACS.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Teaching as a Profession (TAP) Practicum

Primary Career Cluster:	Education and Training
Program Manager:	Elizabeth Rafferty, (615) 532-2840, Elizabeth.Rafferty@tn.gov
Course Code(s):	6126
Prerequisite(s):	*Teaching as a Profession II* (6125)
Credit:	1
Grade Level:	12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Education and Training courses.
Programs of Study and Sequence:	This is the capstone course in the *Teaching as a Profession* program of study.
Aligned Student Organization(s):	Family, Career and Community Leaders of America (FCCLA): http://www.tennesseefccla.org/ Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Teachers who hold an active WBL certificate may offer placement for credit when the requirements of the state board's WBL Framework and the Department's WBL Policy Guide are met. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	Teachers shall hold an active TAP certification provided by the Tennessee Department of Education and a professional license.
Dual Credit or Dual Enrollment Opportunities:	All teachers who plan to teach the Teaching as a Profession program of study courses shall attend the Teaching as a Profession training provided by the Department of Education and successfully attain three micro-credentials during the first year of teaching the TAP course(s).
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html

Course Description

Teaching as a Profession (TAP) Practicum is a capstone course in the Education and Training career cluster for students interested in applying the knowledge and skills learned in previous courses toward becoming a teacher, school counselor, trainer, librarian, or speech-language pathologist. The course covers classroom professionalism, ethics, policies, communications, and career requirements in education and training fields. In addition, students will complete an internship and continue to

create artifacts for their student portfolios. Upon completion of this course, proficient students will be prepared to pursue advanced training at a postsecondary institution.

Work-Based Learning Framework

Internship standards outlined below may take the form of work-based learning (WBL) opportunities (such as internships, cooperative education, service learning, and job shadowing) or industry-driven project-based learning. These experiences shall comply with the Work-Based Learning Framework guidelines established in SBE High School Policy 2.103. As such, this course shall be taught by a teacher with an active WBL Certificate issued by the Tennessee Department of Education and follow policies outlined in the Work-Based Learning Policy Guide available online at https://www.tn.gov/education/career-and-technical-education/work-based-learning.html. The Tennessee Department of Education provides a Personalized Learning Plan template to ensure compliance with the Work-Based Learning Framework, state and federal Child Labor Law, and Tennessee Department of Education policies, which shall be used for students participating in WBL opportunities.

Program of Study Application

This is the capstone course in the *Teaching as a Profession* program of study, providing an opportunity for an internship experience. For more information on the benefits and requirements of implementing these programs in full, please visit the Education and Training website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-education-training.html.

Course Requirements

This capstone course aligns with the requirements of the Work-Based Learning Framework (established in Tennessee State Board High School Policy), with the Tennessee Department of Education's Work-Based Learning Policy Guide, and with state and federal Child Labor Law. As such, the following components are course requirements:

Course Standards

1) A student shall have a Personalized Learning Plan that identifies the student's long-term goals, demonstrates how the Work-Based Learning (WBL) experience aligns with his or her elective focus and/or high school plan of study, addresses how the student plans to meet and demonstrate the course standards, and addresses employability skill attainment in the following areas:
    a. Application of academic and technical knowledge and skills (embedded in course standards)
    b. Career knowledge and navigation skills
    c. 21st Century learning and innovation skills
    d. Personal and social skills

Professionalism, Ethics, and 21st Century Skills

2) Collaboratively develop a professionalism rubric with performance indicators for each of the following professional attributes:
    a. Attendance/punctuality

b. Professional dress and behavior
c. Positive attitude
d. Collaboration
e. Honesty
f. Respect
g. Responsibility
h. Appropriate technology use
i. Reflective teaching practice

3) Analyze the Tennessee Teacher Code of Ethics and compare it to professional ethical standards from recognized educator professional organizations (such as the National Education Association and others) and discuss the purpose of providing specific statements in the code. Research codes of ethics for teachers in specific content areas and special education, where available. Synthesize principles from the standards to create a personal code of ethics.

Policies

4) Use authentic resources (such as federal or state regulations; local education agency policies) to create a checklist of the circumstances under which grades, records, medical information or other student information may be released and to whom.

5) Research and describe the procedure for documenting and reporting child welfare concerns. Analyze a child welfare case study and assess the extent to which the proposed resolution of the case is appropriate.

6) Analyze case studies of problematic school situations and assess the degree to which their proposed resolutions are supported by legal and ethical policies.

Requirements for Careers in Education and Training

7) Access electronic resources from the Tennessee Department of Education Office of Teacher Licensing to identify the teacher certification requirements for the state of Tennessee. Prepare a visual representation comparing the educational and licensing requirements for entering and advancing in specific teaching careers (such as preschool, elementary school, middle school, high school). Include the specific requirements for teaching in various content areas.

8) Review case studies in education and use findings to develop an argument supporting or opposing the use of background checks for teacher hiring, including fingerprinting, drug testing, and checking professional references.

9) Using the Tennessee Educator Acceleration Model (TEAM) – or other appropriate teacher evaluation instrument – investigate the domains and associated indicators of expected teacher behaviors and characteristics. In a coherent narrative, summarize the steps in the educator assessment process and analyze their classroom relevance.

10) Examine job descriptions and occupational requirements for various job training careers within and outside the education field. Write an essay describing a specific job trainer occupation including the requirements to obtain a position at an agency, business, or other entity, the credentials one shall obtain, and the personal and professional attributes needed to be successful.

11) Work in a team to identify local corporate, public and private agencies, businesses, and other entities that provide job training to their employees. Conduct phone or face-to-face interviews with a business employer or employee to discover the specific training styles used and the educational background needed to acquire a training career position. Compile a list of job training opportunities and the credentials needed to attain the careers.

Teaching and Learning

12) Using academic journals and scholarly research on effective teaching practices, investigate the impact of teacher content knowledge and pedagogical knowledge on quality of instruction, as measured by student outcomes. Craft an argumentative essay making a claim about the impact of educator background on student outcomes, developing reasoning with evidence from research.

13) Identify teaching methods advocated by current learning research and describe appropriate research-based practices at developmental levels from ages 9 to 21, including subject-specific teaching practices. Use this research to assign suitable teaching methods to lesson plans created in the previous course and write recommendations for adaptations needed for students with different learning styles or special needs.

14) Build on current understanding of the types and purposes of assessments by creating appropriate assessment tools using examples and findings from current academic research. Write a narrative explaining how assessment results are used for planning instruction. Administer assessments, record results, and provide student and parent feedback.

15) Develop grade-appropriate written and illustrated instructional materials and resources, as well as electronic media (if available), to accompany lesson facilitation during the internships.

Communication

16) Draw conclusions about the relationship between classroom communications and student learning, citing examples from case studies, instructional materials, and academic journals.

17) Develop a communications rubric with performance indicators for effective verbal, non-verbal, written, and electronic communication. Create parent/guardian contact information forms and a draft agenda for parent conferences. Use the rubric to evaluate simulated parent conferences (prior to internships).

Internship

18) Collaboratively, create a rubric that will be used by observers to evaluate preparation for the internship, implementation of lesson plans, and professionalism.

19) During the internship, implement lesson plans developed in a previous course. Annotate accordingly the plans to document the teaching process.

20) Create and continually update a personal teaching journal to document the internship. Draw connections between the experience and course content, thoughtfully reflecting on:
    a. Tasks accomplished and activities implemented
    b. Lesson effectiveness
    c. Positive and negative aspects of the experience
    d. Self-assessment and plans for refining instructional practice
    e. Interactions with students, families, teachers and staff
    f. Personal satisfaction

21) Upon conclusion of the internship, write a reflection paper containing a revised personal teaching philosophy and career growth plan based on the teaching journal. Use technology to create a class presentation showcasing highlights, challenges, and lessons learned from the internship.

The following artifacts will reside in the student's portfolio:

- Revised statement of personal teaching philosophy
- Personal code of professional ethics
- Revised career and professional growth plan
- A description of the internship school, student body, and a job description or list of responsibilities
- Lesson plans, assignments, assessment tools and instructional materials created
- Examples of visual materials incorporated (e.g. graphics, presentation slides, videos, demonstrations) into lessons
- Description of instructional technology used, with examples if appropriate
- Daily teaching journal reflecting on tasks and activities, lesson effectiveness, positive and negative aspects of the experience, self-assessment, plans for refining instructional practice, and interactions with students, families, teachers and staff
- Feedback from supervising teacher at site and from TAP III teacher based on observations, using Tennessee Educator Acceleration Model (TEAM) or other state-approved observation rubric

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning

Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Approved April 10, 2015; Amended April 15, 2016

Anatomy and Physiology

Primary Career Cluster:	Health Science
Program Manager:	Sloan Hudson, (615) 532-2839, Sloan.Hudson@tn.gov
Course Code(s):	5991
Prerequisite(s):	*Suggested prerequisite: Health Science Education* (5995). *Suggested prerequisite or co-requisite: Biology I* (3210)
Credit:	1-2 credits**
Grade Level:	10-12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses. It can also count as a science credit and is accepted by the NCAA as a science course.
Programs of Study and Sequence:	This is the second or third course in the *Diagnostic Services, Nursing Services, Emergency Services, Therapeutic Services and Sport and Human Performance* programs of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visithttps://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are available dual credit/dual enrollment opportunities for this course. For more information, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/content/dam/tn/education/ccte/cte/cte_resource_health_science.pdf

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Course Description

Anatomy and Physiology is designed to develop an understanding of the structures and functions of the human body, while relating those to knowledge and skills associated with pathophysiology. Upon completion of this course, proficient students will be able to (1) apply the gross anatomy from earlier courses to a deeper understanding of all body systems, (2) identify the organs and structures of the support and movement systems, (3) relate the structure and function of the communication, control, and integration system, and (4) demonstrate a professional, working understanding of the transportation, respiration, excretory, and reproduction systems.

Program of Study Application

This is the second or third level course in the *Diagnostic Services*, *Nursing Services, Emergency Services*, *Therapeutic Services, and Sport and Human Performance* programs of study. For more information on the benefits and requirements of implementing these programs in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html.

Course Standards

Organization of the Human Body

1) Review the relationship between anatomy and physiology (A&P) from previous courses differentiating the major organ systems of the human body by their anatomy and physiology and engage in an argument about defined boundaries due to their functional connectivity. Characterize the organizational levels of the human body and observe patterns in cell types and tissue types across organ systems.

2) Use a human model to differentiate the major body cavities and organs located within them. Describe the model using proper anatomical and directional terminology for body regions, planes, and cavities.

3) Evaluate how organisms use positive and negative feedback mechanisms to maintain their internal environment and respond to external environmental changes. Investigate possible consequences that can occur if the body does not maintain homeostasis. Summarize how cellular metabolism can affect the body's homeostatic state.

Support and Movement

4) Analyze the anatomical structures of the integumentary system and investigate their role in the physiological processes of protection, temperature homeostasis, and sensation. Assess the microscopic components of the skin layers in a cross-sectional image summarizing potential diseases, disorders, and syndromes possible for each layer.

5) Summarize the processes of bone formation, growth, and repair. Diagram microscopic bone structures, identifying regions that participate in hematopoiesis and storage of minerals and fat. Discuss diseases and disorders of the skeletal system as they relate to bone formation, growth, repair, hematopoiesis, and storage of minerals and fat.

6) Label on a skeleton, the major bones within the axial and appendicular divisions, relating their physiological roles in creating a body scaffold, internal organ protection, and anchor points for skeletal muscles participating in movement. Demonstrate the generation of movement of bones through antagonistic muscle groups.

7) Classify joints based on their structure and function. Compare and contrast the three types of joints and provide an example of each including the involvement of tendons, ligaments, bursae, and cartilage where applicable. Determine the effects of various types of arthritis on each category of joint.

8) Differentiate visceral, cardiac, and skeletal muscle tissues based on anatomical criteria and their physiological role in the movement of body parts and/or substances. Model the gross and microscopic anatomy of skeletal muscle and muscle fibers and provide examples of possible pathophysiology. Use the model to highlight major muscle groups and explain the physiology of skeletal muscle contraction.

Communication, Control and Integration

9) Relate the hormones produced by the endocrine system to the glands that produce them and their effects on target organs using the concept of negative feedback. Explain the relationship between receptors and ligands and differentiate between steroid and non-steroid hormones as ligands.

10) Compare and contrast the anatomy of the central nervous system and the peripheral nervous system including possible diseases and disorders of each. Link structures to their physiological roles and include the structure and function of the somatic and autonomic nervous systems in the explanation. Interpret the importance of cerebrospinal fluid and its connection to circulation including the phenomenon of the blood-brain barrier within the brain in the explanation.

11) Label the cellular and subcellular structures of neurons and explain the molecular neurophysiology of membrane potentials and the conduction of information through synaptic transmission. Evaluate the process of action potentials of the nervous system and name the factors that affect the speed at which a nerve impulse travels.

12) Model the major parts of the brain and spinal cord relating each to its source of sensory information and/or its primary target of regulation. Identify and describe the types of sensory receptors found in the human body and explain the structures, functions, and limitations of the human sensory systems: hearing, balance/proprioception, sight, touch, smell, and taste.

Respiration, Transportation, and Defense

13) Create an artifact to outline the structure and functions of the cardiovascular system, paying special attention to the musculature of the walls, the chambers, and the valves of the heart and blood vessels. Demonstrate the circulation of blood through the heart comparing and contrasting systemic and pulmonary circulation.

14) Describe the phases of the cardiac cycle and the heart's internal and external control mechanisms involved in producing the heartbeat. Discuss how heart rate and cardiac output relate to one another. Listen to heart sounds, either digitally or with a stethoscope, to identify the normal and abnormal sounds made during the cardiac cycle. Give reasons for the abnormal sounds encountered.

15) Create or use a model of the human heart to clarify systole and diastole related to blood pressure and the factors affecting blood pressure's role in homeostasis. Discuss the heart's intrinsic and extrinsic control mechanisms involved in producing a heartbeat.

16) Examine how the anatomy of the respiratory system functions to provide oxygen and carbon dioxide transport mechanisms between the lungs and the circulatory system, considering capillary structures, red blood cell structures, diffusion and affinity. Discuss pathophysiology of the cardiorespiratory system and its effects on the human body.

17) Identify the liquid and cellular components of blood using appropriate medical terminology. Summarize the structural characteristics, normal levels, function and life span of each. Analyze how and where each component is manufactured (i.e., as with hematopoiesis and erythropoiesis) and the possible complications with the development of cellular components.

18) Breakdown the roles of antigens and antibodies in the blood while explaining the ABO system and Rh classification system. In a lab setting with simulated blood, determine the ABO and Rh of samples with an explanation of results including a description of cross-matching and the causes and possible outcomes of a transfusion reaction.

19) Assess the relationship between the structure and function of the lymphatic system. Differentiate between innate and adaptive immunity, the cells involved, and how each functions to maintain homeostasis in the body.

20) Interpret the relationship between the integumentary, muscular, and cardiovascular systems in temperature homeostasis. Relate how malfunctions in any of the three systems can affect temperature regulation.

Nutrition, and Excretion

21) Model the sequential organization of the alimentary canal and its accessory organs in order to describe the physiological role of each including a discussion of the major digestive enzymes and hormones produced along with their functions. Outline how the hepatic portal system couples the digestive and cardiovascular systems.

22) Analyze gastrointestinal wall histology and interpret how the anatomical architecture supports the efficient absorption and transport of molecules into the cardiovascular or lymphatic circulation. Discuss possible outcomes of a disruption of this process.

23) Demonstrate the progression of lipid transport from the digestive system, through the lymphatic system, and into the cardiovascular circulation.

24) Design a concept map of the structures of the urinary system in order to establish the physiological role of blood filtration and waste excretion from the body. Include a detailed description of the parts of a nephron and how they assist in homeostatic mechanisms through urine formation. Clarify how disorders of the urinary system affect homeostasis.

Reproduction, Growth, and Development

25) Outline the structure and function of the male and female reproductive systems that provide the physiological functions of gametogenesis, fertilization, and embryogenesis, based on the secretion of hormones. Correlate the endocrine tissues of the reproductive system with their roles in regulation of secondary sex characteristics, the female menstrual cycle, pregnancy, fetal development, and parturition.

26) Examine the microscopic structures of the human egg and sperm and determine how those structures relate to their function. Evaluate the process of fertilization then create a timeline of the phases of fetal development from fertilization until birth. Describe the abnormalities that can occur at each phase.

The following artifacts are to reside in the student's portfolio:

One artifact from each of the following content areas:

a. Support and Movement
b. Communication, Control, and Integration
c. Respiration, Transportation and Defense
d. Nutrition, and Excretion
e. Reproduction, Growth, and Development

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Behavioral and Community Health

Primary Career Cluster:	Health Science
Program Manager:	Sloan Hudson, (615) 532-2839, Sloan.Hudson@tn.gov
Course Code(s):	6130
Prerequisite(s):	*Health Science* (5998)
Credit:	1
Grade Level:	10
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
Programs of Study and Sequence:	This is the second course in the *Public Health* program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
Teacher Endorsement(s):	577, 720, 722
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/content/dam/tn/education/ccte/cte/cte_resource_health_science.pdf

Approved April 10, 2015; Amended April 15, 2016

Course Description

Behavioral and Community Health is an applied course for students interested in developing a rich understanding of the ways that communities experience and treat health-related issues. Upon completion of this course, students will be able to use research and data to understand the health and wellness of his/her community, state, region, and nation; differentiate between health and wellness; relate that knowledge to social epidemiology and determinants of health; draw key connections between behavioral health issues and community health issues; and identify professionals who can provide care.

Program of Study Application

This is the second course in the *Public Health* program of study and builds knowledge and skills necessary for success in the capstone course, *Public Health Practicum*. For more information on the benefits and requirements of implementing this program in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html

Course Standards

Overview of Healthcare History, Systems, and Legislation

1) Gather relevant information from multiple sources (in both print and digital formats) concerning the history of, and relationships between, community health, disease outbreaks and psychosocial disorders in order to understand how community health has formed the basis of the modern healthcare system. Research notable historical figures, time periods, and/or practices to develop a visual, oral, and/or written presentation that cites specific textual evidence to support analysis.

2) Differentiate between health, healthcare, and healthcare systems/organizations related to community and mental health, and explain their evolution in modern society. Use information from governmental agencies, such as the Center for Disease Control and Prevention (CDC), to identify health disparities (for example, rates of childhood obesity in different regions) in the United States population, and idenfity organizations and agencies that can be utilized to address identified disparities.

3) Define epidemiology and identify social and community health issues prevalent in a specific community. Research social determinants impacting a specific health issue, including but not limited to age, behavior, race/ethnicity, environment, geography, social status, income, and other factors that contribute to diseases and disorders. Summarize findings in a graphic illustration or informational artifact in order to participate in a discussion comparing and contrasting health of communities with different demographic data.

4) Research and summarize major state and federal legislation related to behavioral and community health using both primary sources (such as laws) and secondary sources (such as media reports). Construct an argumentative essay describing the effects of these laws on the provision of healthcare in Tennessee and the implications for at-risk populations. In the essay, compare and contrast findings presented in media about legislation, citing specific textual

evidence to support a claim and assess extent to which reasoning and evidence may support or refute identified counterclaim(s).

5) Identify public health risks and emergencies that impact healthcare delivery. Create a flow-chart of how local, state, and federal governments coordinate to handle requests for assistance related to human resources, supplies/equipment, and medical countermeasures.

Careers

6) Research careers within the public health and mental health fields and document educational requirements as well as state and national guidelines governing practicing professionals (such as licensing, certifications, training, compliance). Identify potential training programs, schools, and examinations appropriate to obtain required credentials for a specific occupation.

7) Research and summarize the range of skills, competencies, and professional traits required for careers in the public health and mental health fields. Compare findings to current individual strengths and identify opportunities for personal development. Translate real-time and projected labor market data into narratives to identify local and national employment opportunities and determine areas of growth within public health and mental health fields.

Legal and Ethical Issues

8) Compare and contrast the specific laws and ethical issues that impact relationships among patients/clients and healthcare professionals (for example, patient confidentiality). Citing specific textual evidence to support reasoning, participate in a verbal or written debate as related to behavioral and community health by developing claim(s) and counterclaim(s).

9) Research the Americans with Disabilities Act of 1990 (ADA), the American Hospital Association's "Patient Bill of Rights," the Omnibus Budget Reconciliation Act of 1990 (OBRA), and the Patient Self-Determination Act of 1990 (PSDA). Explain to a patient/client or classmate the rights of a patient or client, depending on differences in age, mental status, and competency. Cite the above documents in clear, coherent language to describe the relationships among concepts of patient rights.

10) Summarize the Health Insurance Portability and Accountability Act (HIPAA) within the context of mental health and community health treatment, and relate key provisions of the act to patient rights. Develop a brochure or factsheet, which can be shared with minors, adults, and non-English speaking individuals that defines key words and phrases, illustrates key points, and cites specific textual evidence from the act.

11) Construct an argumentative essay contrasting patient/client rights with a community's right to know about dangerous mental health clients or persons with communicable diseases, citing evidence from legislation and news articles to support claim(s) and counterclaim(s).

12) Research sections of the Patient Protection and Affordable Care Act of 2010 (ADA) related to community health and preventive medicine, synthesizing a variety of professional, journalistic, and medical perspectives on the ramifications of the act for individuals and communities.

Select one of the preventive guidelines listed in the prevention/wellness section of the law and develop a plan to implement it for a given community. For example, to increase access to fresh produce, a plan may include a gap analysis, list of stakeholders, budget, and timeline for activities using domain-specific language.

13) Research Crisis Standards of Care and the impact on healthcare delivery. Synthesize concepts from these standards to create an oral or written argument for temporarily adjusting standard healthcare delivery practices that favors the needs of the community over the needs of individuals.

Social Perception and Prevalence of Diseases and Disorders

14) Assess the costs associated with providing long-term care to patients/clients with mental or chronic conditions. Compare and contrast these costs against alternative treatment methods such as institutionalization or preventative care. Incorporate evidence from the Long-Term Care section of the Patient Protection and Affordable Care Act of 2010 (ADA), The Mental Health Parity and Addiction Equity Act of 2008, TennCare guidelines, and rates quoted by competing insurance companies.

15) Evaluate health data from a range of sources (such as the World Health Organization, Centers for Disease Control and Prevention) to determine the social perception and prevalence of chronic, mental, and environmental health diseases and disorders. Research should incorporate relevant health indicators, clinical trials, risk factors, and clinical perspectives using domain-specific language. Prepare a graphic illustration to summarize findings in clear, coherent language, citing specific textual evidence.

16) Identify at risk population groups that need customized messaging and healthcare delivery during emergencies due to disease specific needs, medical device needs, limited access to care/support, or language barriers. Develop an informative/explanatory text discussing the needs of one specific group, citing local incidence information as compared to state, region, and national data. Include existing policies or plans that target the needs of the group, and healthcare interventions available.

17) Investigate stigmas surrounding mental health and illness, obesity, smoking, drug abuse, and other public health issues in the community. Develop a public service announcement (PSA) or presentation to build awareness and understanding of the disease/disorder, addressing common misconceptions, outlining signs and symptoms, and providing strategies for management or containment.

Mental Health Issues

18) Distinguish among the different domains of psychology, including but not limited to biological, clinical, cognitive, developmental, educational, experimental, and industrial-organizational domains. Articulate in a verbal, written, or digital format the key features, methodologies, basic assumptions, applications, and strengths and weakness of each domain.

19) Differentiate the signs and symptoms of common psychobiological disorders, including anxiety disorders, depressive disorders, bipolar disorders, eating disorders, cognitive disorders, additive disorders, personality disorders, sleep disorders, and factitious and dissociative disorders. Investigate available treatments and scientific research regarding the management of different psychobiological disorders. Research at least one historical and one modern case study and discuss the implications for the health of communities citing specific textual evidence from the case studies.

20) Research trauma interventions for dealing with crisis and disaster, suicide, anger, aggression and violence, and physical, emotional, and sexual abuse. Identify major legislation that has been recently changed or developed in response to the prevalence of trauma in society and hypothesize outcomes of legislation. Test hypotheses using case studies.

Treatment and Therapeutic Communication

21) Examine the various treatment methodologies prescribed for mental and chronic health issues and explain why certain diseases and disorders call for different types of treatment, including but not limited to pharmacological regimens, changes in diet and exercise, counseling, and different types of therapy.

22) Research the mitigation of disease severity through implementation of different types of interventions including Medical Countermeasures (antibiotics, vaccines) and Non-Pharmaceutical Interventions (community mitigation steps). Develop a detailed treatment plan with goals and objectives, Medical Countermeasures, and Non-Pharmaceutical Interventions for one of the mental conditions and one of the health issues studied in this course. Cite specific textual evidence to defend elements of plan.)

23) Research and apply concepts of therapeutic communication in a mock scenario role-play surrounding a psychobiological or traumatic situation.

24) Research, identify, and define the steps involved in psychiatric therapeutic holds and the skills necessary to apply Crisis Prevention Intervention techniques when dealing with someone in a mental health crisis using accurate medical terminology. Role-play these skills in a classroom for patients/clients experiencing one of the diseases or disorders identified in the course.

25) Synthesize the knowledge acquired in this course to draw connections between mental illnesses/disorders with broader issues affecting the health of communities. In a sustained research project, examine how families and neighborhoods can change as the result of chronic or acute incidents of trauma, such as generational poverty or acts of terrorism, and discuss the implications for community structure, family dynamics, and financial stability when mental health issues are prevalent within a community. Develop, edit, and revise a detailed plan to alleviate the effects of one such issue on a community, incorporating written, oral, and digital components to support the presentation of the plan.

26) Analyze emergency communication using resources such as the Centers for Disease Control's Crisis Emergency Risk Communication plan. Create a mock press release or script using

recommendations for successful emergency communication related to a recent disaster or crisis.

The following artifacts will reside in the student's portfolio:

a. Standard 3 Graphic illustration or informational artifact comparing and contrasting health of communities with different demographic data.
b. Standard 10 Argumentative essay over a community's right to know about dangerous persons
c. Standard 15 Graphic illustration to summarize social perception of chronic mental and environmental health diseases and disorders
d. Standard 25 Detailed plan to alleviate the effects of community issues

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Cardiovascular Services

Primary Career Cluster:	Health Science
Program Manager:	Sloan Hudson, (615) 532-2839, Sloan.Hudson@tn.gov
Course Code(s):	6131
Prerequisite(s):	*Diagnostic Medicine* (5994)
Credit:	1
Grade Level:	11-12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
Programs of Study and Sequence:	This is the fourth course in the *Diagnostic Services* program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	Certified EKG Technician (CET) with completion of appropriate clinical Internship.
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/content/dam/tn/education/ccte/cte/cte_resource_health_science.pdf

Course Description

Cardiovascular Services is an applied course in the *Diagnostic Services* program of study intended to prepare students with an understanding of the roles and responsibilities of those seeking employment in the cardiovascular field of healthcare. Upon completion of this course, proficient students will have a thorough understanding of the anatomy and physiology of the heart and be knowledgeable about both invasive and non-invasive cardiovascular procedures. Students will incorporate communication, goal setting, and information collection skills to be successful in the workplace. Students who complete a *Clinical Internship* in addition to this course will be eligible upon

graduation to sit for the Certified EKG Technician (CET) Exam. Relevant standards are indicated below with (CET).

Program of Study Application

This is the fourth course in the *Diagnostic Services* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html.

Course Standards

Career Planning

1) Research careers within cardiovascular and pulmonary sciences and explain in a graphic illustration or informational artifact** the educational/credentialing requirements, scope of practice, as well as state and national compliance guidelines required of cardiovascular health care professionals.

2) Analyze the range of skills, competencies, and professional traits (such as leadership, time management, and ethical responsibility) required for careers in cardiovascular or pulmonary sciences. Using real-time and projected labor market data, identify local and national employment opportunities and determine areas of growth. Complete a job application, resume, and cover letter for one of the jobs located in the search.

Legalities and Ethical Issues

3) Summarize the Health Insurance Portability and Accountability Act (HIPAA) and explain procedure and guidelines concerning receiving and verifying physician orders, identifying the patient/client, and obtaining patient's consent to perform procedures. Identify the procedures that require written permission and those that require only verbal consent. Role-play these procedures in a classroom and/or clinical setting. Explain, using domain-specific language and accurate definitions of legal concepts, how the content of these legal documents impacts patients' rights for all aspects of care.

4) Compare and contrast the costs of preventive medical procedures versus diagnostic medical procedures related to the cardiovascular and pulmonary system. Use information found in news media, professional journals, and trade magazines to help determine if preventive procedures would increase or decrease health care cost as it relates to heart health.

Anatomy and Physiology

5) Relate the gross and cellular structure and function of the cardiovascular and autonomic systems to the following areas.

    a. Electrophysiology of the heart, including definitions of waveforms
    b. Control mechanisms and cardiac cycle with normal values (CET)
    c. Size, location, layers, chambers, valves, pressures, and blood flow of heart (CET)

d. Relationship of cardiac output to heart rate and stroke volume (CET)

6) Interpret the pathophysiology related to normal and abnormal heart sounds and breath sounds. Evaluate simulated heart sounds to identify normal heart sounds, normal lung sounds, murmurs, rubs, extra heart sounds, wheezes, or other abnormal breath sounds via a mannequin or digital substitute.

7) Choose a disease, disorder, or emergency situation related to the cardiac, circulatory, pulmonary, or autonomic systems drawn from news media, textbooks, professional journals, or trade magazines. Develop an oral or visual presentation interpreting the scope of the disease/disorder/emergency, basic pathophysiology, affected populations, pharmacological interventions, signs and symptoms, risk factors, existing practices that target the disease/disorder, and interventions available.

8) Formulate a written and digital health education project to inform an adult and/or geriatric audience about the negative effects of complications such as electrolyte imbalance, obesity, hypertension, diabetes, or renal impairment on the heart, circulatory, and pulmonary systems.

Diagnostics and Procedures

9) Perform the following duties and tasks related to pre-procedural activity: (CET)
    a. Perform universal precautions (e.g., hand washing, Personal Protective Equipment)
    b. Transport the patient
    c. Prepare the patient (shaving, cleaning skin, etc., should be simulated on mannequin)
    d. Collect patient information
    e. Enter information into Electrocardiogram (ECG) machine
    f. Identify proper landmarks on mannequin
    g. Maintain patient safety throughout the pre-procedural process
    h. Vital sign assessment
    i. Pulse oximeter

10) Differentiate between bipolar, unipolar, and precordial leads. Relate their importance in performing an ECG test correctly. Include the concept of Einthoven's Triangle in the explanation.

11) Compare and contrast the single- and three-channel ECG machines. Demonstrate the ability to define the purpose of the equipment, and explain indications for use, expected outcomes, advantages, disadvantages, and limitations of each.

12) Summarize the history of the ECG machine including aspects of industry standardization and advances in technology. Use a timeline or other graphic to illustrate the major developments.

13) Understand principles of and successfully perform skills related to performing a resting ECG (12 lead, 15 lead, etc.), incorporating rubrics from textbooks or clinical standards of practice for the following: (CET)
    a. Gather supplies and equipment

b. Educate patient on procedure expectations
c. Apply electrodes and leads to patient
d. Confirm equipment
e. Perform standard ECG

14) Obtain ECG tracing strips and perform rhythm analysis, including the following: (CET)
    a. Analyze ECG tracing for presence of P, Q, R, S, and T waves, and heart rate calculation,.
    b. Identify ECG tracings indicative of sinus, junctional, atrial, ventricular, atrioventricular, hypertrophy, chamber enlargement, and pacemaker rhythms. Include intraventricular conduction and myocardial perfusion tracings.
    c. Identify electrical interference and somatic tremor on an ECG tracing, as well as the steps to take to alleviate or prevent such artifacts.
    d. Correlate ECG finding (wavelengths, segments, intervals, etc.) with cardiac function.
    e. Correlate ECG morphology with anatomy and physiology.

15) Role-play explanation of the cardiovascular reflex test in a mock clinical setting. Discuss at minimum the following: overview or explanation of the test, the associated risks, patient expectations before, during, and after the test, and next steps for abnormal results.

16) Summarize in a written, oral, or digital presentation the scope of a typical electrocardiograph test. Draw evidence from textbooks, professional journals, and online healthcare sites (such as Cleveland Clinic, MedLine Plus, and Mayo Clinic) to produce an overview or explanation of the test, the associated risks, and patient expectations before, during, and after testing.

17) Construct a chart or a graph that differentiates between the various types of nuclear imaging and the radiographic cardiovascular and pulmonary test. Include within this graph or chart an overview or explanation of the test, the mechanics of the procedure, the associated risks, and patient expectations before, during and after testing. Obtain information from textbooks, professional journals, and online healthcare sites (such as Cleveland Clinic, MedLine Plus, and Mayo Clinic).

18) Research the types of invasive diagnostic procedures. Examples might include cardiac catheterization, carotid angiography, electrophysiological studies, intravascular ultrasound, or myocardial biopsy. Develop a patient education packet utilizing medical and non-medical terminology, including the following information: overview or explanation of the procedure, the associated risks, patient expectations before, during, and after the test, and next steps for abnormal results.

19) Differentiate between the various types of cardiovascular ultrasound procedures. Discuss what an ultrasound can identify that other procedures might not, in addition to the risk considerations, reliability of results, and proper interpretation of an ultrasound image. Role-play teaching another classmate about the type of procedure that has been ordered by the physician.

Invasive Treatment Procedures

20) Research treatments involving cardiac, vascular, and thoracic surgery for cardiovascular and pulmonary diseases and/or disorders. Analyze in written, oral, or digital format the implications for each, identifying trends and/or advances in available treatments over the past fifty years.

21) Identify characteristics and/or signs and symptoms of patients experiencing cardiac and/or pulmonary complications in physician offices or emergency rooms. Create a plan of action for assessment, diagnosis, and treatment of the patient.

Health Statistics

22) The Centers for Disease Control (CDC) suggests that the number one leading cause of deaths in the United States is heart disease, according to 2012 data. Complete a short research project to identify on the local level the 1) incidence of heart disease and disorders, 2) number of associated deaths, 3) preventive measures currently being taken, and 4) available educational programs and initiatives. Document findings in an oral, digital, or visual presentation. Information can be found from organizations such as the CDC, state and county health department websites, and interviews with public health and emergency professionals.

23) Research the Healthy People Initiative sponsored by the U.S. Food and Drug Administration (FDA). Identify the goals and objectives, established baselines, and strategies to facilitate progress toward the initiative's goals. Then, develop a marketing campaign to inform a variety of audiences about the initiative. The campaign can include a public service announcement, community awareness project, health education project, and/or public health education project shared with local schools, leaders in the community, and the general public.

The following artifacts will reside in the student's portfolio:

a. Standard 8 Health education artifact for adult or geriatric audience
b. Standard 9 Skills checklist
a. Standard 13 Skills checklist
b. Standard 21 Plan of action for assessment, diagnosis, and treatment of patient experiencing cardiac or pulmonary complications

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Additional Standards Notes

**Informational artifacts include, but are not limited to, brochures, posters, fact sheets, narratives, essays, and presentations. Graphic illustrations include, but are not limited to, charts, rubrics, drawings, and models.

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Dental Science

Primary Career Cluster:	Health Science
Program Manager:	Sloan Hudson, (615) 532-2839, sloan.hudson@tn.gov
Course Code(s):	6134
Prerequisite(s):	*Health Science* (5998)
Credit:	1
Grade Level:	11-12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
Programs of Study and Sequence:	This is the second or third course in the *Therapeutic Services* program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	National Entry Level Dental Technician (NELDA) with completion of appropriate Clinical Internship.
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html

Course Description

Dental Science is an applied course in the *Therapeutic Services* program of study intended to prepare students with an understanding of the roles and responsibilities of the dental health care professional

within the application of dental care. Upon completion of this course, proficient students will be able to differentiate the many careers in dentistry, assess, monitor, evaluate, and report on the dental health of patients/clients and relate this information to overall health, apply appropriate dental terminology, and perform clinical supportive skills. In addition, students will continue to build a health science career portfolio that will follow them throughout their chosen program of study.

Program of Study Application

This is the second or third applied course in the *Therapeutic Services* program of study. For more information on the benefits and requirements of implementing this program in full, visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html

Implementation options are as follows:

- Option 1: Dental Services taught as a Level Two Course
- Option 2: Dental Services taught as a Level Three Course

Core standards are required for both options above.
Core standards: 1,2,3,4,5,6,7,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25

Additional standards:
Option 1: 8,9
Option 2: 10

Course Standards

Careers in Dental Science

1) Gather relevant information from textbooks and online searches concerning the history of dentistry, with emphasis on changes in care and prevention. Develop a visual, oral, and/or written presentation of the information that includes graphs, technology, and supporting evidence.

2) Research careers within the dental sciences and explain in a graphic illustration or informational artifact** the educational/credentialing requirements, as well as state and national compliance guidelines required of health care professionals. Include other branches of dentistry such as Orthodontics and Endodontics.

3) Analyze the range of skills, competencies, and professional traits (such as leadership, time management, and ethical responsibility) required for careers in dental sciences. Using real-time and projected labor market data, identify local and national employment opportunities and determine areas of growth. Complete a job application, resume, and cover letter for one of the jobs located in the search.

Legalities and Ethical Issues

4) Choose an ethical issue affecting dental health professionals, such as leaving fluoride out of drinking water, the practice of dental tourism, or the affordability of dental care among

vulnerable populations like the elderly. Craft arguments focused on the issue, including the development of claim(s) and counterclaim(s) justified with data and evidence. Discuss how this issue will affect or has affected the dental community.

5) Examine the legal responsibilities of dental professionals when treating patients/clients with diseases or disorders related to infections transmitted sexually or through drug use, domestic violence, neglect, and child abuse. Construct an informational article intended to raise awareness among dental professionals. Incorporate the correct dental terminology. (

6) Compare and contrast the dental care and prevention customs and cultural beliefs of various populations. Examples might include soaking a cotton ball in turpentine for tooth pain relief or using bleach to whiten teeth. Develop an informative paper intended to reconcile such beliefs with advances in dental science.

7) Compare and contrast the average cost of private dental insurance plans versus government-issued plans. Analyze the cost for both pediatric and adult patients for treatments such as a routine dental visit, a visit that requires fillings, and a visit that requires tooth extraction. Role-play therapeutic communication utilizing correct dental terminology to explain the cost with a classmate and/or family member.

Anatomy and Physiology

8) Outline the gross and cellular structure and function of head and neck anatomy, including bones, muscles, sinuses, salivary glands, nerves, and blood vessels.

9) Choose a research topic related to embryonic development of the head, oral cavity, and teeth. Gather relevant information from print and digital medical and/or dental resources such as the American Journal of Dentistry. Complete a short research project, including editing work after peer-review, culminating in a scientific report that examines the environmental and genetic factors affecting embryonic development, using dental and medical terminology.

10) Choose a research topic related to embryonic development of the head, oral cavity, and teeth. Gather relevant information from print and digital medical and/or dental resources such as the American Journal of Dentistry. Complete a short research project, including editing work after peer-review, culminating in a scientific report that examines the environmental and genetic factors affecting embryonic development, differentiating between normal and abnormal findings using dental and medical terminology.

11) Formulate a written and digital health education project to inform an audience about the parts and functions of teeth. Include the effects of nutrition on tooth development and continuous good health and dental prevention care.

12) Determine the meaning of the universal dental numbering system's name; then, number the teeth located in the human dentition on a model or chart. Explain the difference in each of the numbering systems as presented in text by paraphrasing them in simpler yet accurate terms.

13) Choose a dental health disease or disorder. Examples might include dental caries in babies who drink juices from a bottle or oral cancer in smokeless tobacco users. Develop a professional report discussing the scope of the disease/disorder, affected and vulnerable populations, local incidence information as compared to state, region, and national data, existing practices that target the disease/disorder, and interventions available.

Microbiology, Infection Control, and Disease Prevention

14) Define the terms pathogenic and non-pathogenic microorganisms, and explain how each can cause a disease or disorder. Outline modes of transmission and prevention of the spread of these organisms.

15) Investigate oral manifestations related to pathogenic and non-pathogenic organisms. Develop an informational text to share with other health care professionals that outlines concepts of disinfection, OSHA standards, and use of Personal Protective Equipment (PPE) to prevent spreading of disease to dental staff.

16) Differentiate among toxic, corrosive, ignitable, and reactive hazardous wastes in dental facilities. Discuss the role of the Material Safety Data Sheets (MSDS) in identifying hazards associated with specific chemicals or chemical compounds by evaluating MSDS information. Develop a chart describing the characteristics of the most common chemicals and compounds found in the dental office.

Dental Examinations

17) Understand principles of and successfully perform skills related to Dental Assisting, incorporating rubrics from textbooks or clinical standards of practice for the following:
    a. Operatory preparation for treatment and receiving of the patient
    b. Positioning of the patient and the clinician
    c. Radiographic process and patient/operator protection
    d. Oral prophylaxis

18) Identify basic dental office instrumentation and explain the purpose of each item. Role-play a scenario based in a dental office that uses at least five instruments accurately, including patient assessment, procedure for operatory preparation of the patient room, receiving and seating the patient, and providing at least one treatment.

19) Develop a patient health education plan including preventive measures, signs and symptoms of exacerbation of disease/disorder/injury, pharmacological needs, and support systems. Cite at least three medical or dental resources.

20) Summarize the signs and symptoms of impending or developing dental emergencies, citing environmental, medical, and hygienic factors that may contribute to the condition. Develop an office emergency policy and procedure that outlines the responsibilities and actions of each healthcare worker.

21) Complete training in American Heart Association or American Red Cross adult and child Cardiopulmonary Resuscitation (CRP). Students should be certified in either Heartsaver or BLS for Healthcare Provider CPR prior to clinical rotation. (

Dental Procedures and Specialties

22) Follow medical procedures precisely when performing patient/client skills in a classroom or clinical setting related to the role of the Dental Assistant, including:
    a. Complete health/dental history
    b. Perform vital signs
    c. Coronal polishing
    d. Fluoride treatment
    e. Preparation of restorative materials
    f. Preparing and alginate impression
    g. Cleaning and sterilizing equipment
    h. Patient and/or community education on oral health
    i. Document findings and procedure in a recognized format for a dental facility using correct dental terminology

23) Incorporate medical/dental language in the development of a detailed dental treatment plan for a case study or live patient, describing goals and objectives, medications, and/or alternative treatment and coping mechanisms, and incorporating applicable assessment information following interview/assessment of a patient or family member.

24) Research emerging dental technologies related to dental and oral health, including but not limited to procedures, equipment, and diagnostics tools. Synthesize information into a coherent understanding and develop a written or verbal presentation. Draw evidence from informational text to support research.

25) Research a dental specialty procedure (such as oral surgery, prosthetic dentistry, or gingivoplasty), then develop a written or verbal explanation of the procedure using correct dental terminology. Include at minimum the purpose of the procedure, average cost, documented benefits and potential side effects, and profile of the dental professional that performs the procedure.

The following will reside in the student's portfolio:

a. Standard 8 Research artifact
b. Standard 9 Health education project
c. Standard 19 CPR certificate
d. Standard 20 Skills check lists

Standards Alignment Notes

*References to other standards include:

- American Red Cross BLS CPR Guidelines. http://www.redcross.org/.
- American Heart Association BLS Guidelines. http://www.heart.org/HEARTORG/#.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning

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- Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Additional Notes

**Informational artifacts include, but are not limited to, brochures, posters, fact sheets, narratives, essays, and presentations. Graphic illustrations include, but are not limited to, charts, graphs, rubrics, drawings, and images.

Emergency Medical Services

Primary Career Cluster:	Health Science
Program Manager:	Sloan Hudson, (615) 532-2839, Sloan.Hudson@tn.gov
Course Code(s):	5995
Prerequisite(s):	*Health Science* (5998), *Medical Therapeutics* (5999), and *Anatomy & Physiology* (3251 or 5991)
Credit:	1
Grade Level:	11-12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
Programs of Study and Sequence:	This is the fourth course in *Emergency Services* program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	Emergency Medical Responder (EMR), if teacher is an authorized EMS Instructor at the EMR level for EMR 60 hours of instruction; if not authorized, then the program shall have an authorized instructor to coordinate with the local office of EMS and provide required training.*
Dual Credit or Dual Enrollment Opportunities:	There are dual credit/dual enrollment opportunities available for this course. Reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	If teachers are teaching this course as First Responder certification, then they shall have 8 hours of training provided by Department of Education. In addition, teachers shall be WBL training certified.
Teacher Resources:	https://www.tn.gov/content/dam/tn/education/ccte/cte/cte_resource_health_science.pdf

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*National Emergency Medical Services Educational Standards should be incorporated into instruction.

Course Description

Emergency Medical Services is a capstone course in the Emergency Medical Services program of study and is designed to prepare students to pursue careers in the fields of emergency medicine. Upon completion of this course, proficient students will be able to: identify careers and features of the EMS system; define the importance of workforce safety and wellness; maintain legal and ethical guidelines; correlate anatomy and physiology concepts to the patient with a medical or traumatic injury; and perform EMS skills with a high level of proficiency. If taught with an EMT instructor, students will be given the opportunity to sit for the National Emergency Medical Responder certification. In addition, students will continue to add artifacts to a portfolio, which they will continue to build throughout the program of study.

Each standard presumes that the expected knowledge and behaviors are within the scope of practice for that EMS licensure level, as defined by the National EMS Scope of Practice Model. Each competency applies to patients of all ages, unless a specific age group is identified. The standards also presume there is a progression in practice from the Emergency Medical Responder level to the Paramedic level. The descriptors used to illustrate the increasing complexity of knowledge and behaviors through the progression of licensure levels originate, in part, from the National EMS Scope of Practice Model.

Note: If this course is taught for EMR certification, the program shall be approved by the TN Department of Health, Office of Emergency Medical Services. ***Students enrolled in this course shall be 17 years old before the course concludes.***

Program of Study Application

This is the capstone course in the *Emergency Services* program of study. For more information on the benefits and requirements of implementing these programs in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html

Course Requirements

This capstone course aligns with the requirements of the Work-Based Learning Framework (established in Tennessee State Board High School Policy), with the Tennessee Department of Education's Work-Based Learning Policy Guide, and with state and federal Child Labor Law. As such, the following components are course requirements:

Course Standards

EMS Systems and Operations

1) Compare and contrast the types of Emergency Medical Services (EMS) systems and operations, including ground, water, and air services. For each type of service, discuss how the public accesses EMS systems, the advantages and disadvantages, special considerations, and safety issues. Discuss the roles played by the state departments of EMS and the National Highway Traffic Safety Administration.

2) Research the history of mapping, geographic information systems (GIS), global positioning systems (GPS), remote sensing, and other geospatial technologies. Examine how these technologies have evolved in the area of EMS, concentrating on their recent migration towards online platforms, and evaluate their influence on present-day society, citing specific textual evidence from news articles and scholarly journals.

3) Differentiate between the careers in various types of EMS. Research and document educational requirements as well as state and national guidelines governing practicing professionals (such as licensing, initial certifications, re-certifications, training, and compliance). Identify personal and physical characteristics required of an EMS professional in a career portfolio.

4) Using texts from EMS professional journals or websites, evaluate concepts of quality improvement to provide safe, high quality, and appropriate patient care and the impact of research on EMR care. Cite examples of research that have been incorporated into improving emergency care for patients and/or victims of accidents/injuries.

5) Outline the risks and responsibilities facing the emergency response team during ambulance operations. Address at minimum the following: apparatus and equipment readiness; pre-arrival considerations, especially for high-risk situations; scene safety of personnel and patient(s); traffic; 360 degree assessments; and how to leave a scene.

6) Research and summarize the concepts surrounding vehicle extrication, including safe vehicle extrication, tools used, and patient considerations. Include in the summary common guidelines related to the following: roles of EMS; safety of staff, patients, and situation; vehicle stabilization; unique hazards; additional resources needed; and extrication considerations.

Safety and Wellness

7) Develop a reference toolkit of physical, mental, and personal requirements for personnel in emergency and public safety services. Document what the “profile of proficiency” looks like for professionals in these fields—for example, what scores are needed on a physical, mental, or emotional fitness test, and what guidelines shall be followed for personal disease/disorder control.

8) Investigate stress management procedures for professionals in the emergency response and public service sectors. Identify stressors and stress-inducing situations through interviews with professionals in the field. Collaborate with a team to identify techniques and strategies for managing and alleviating stress. Communicate recommendations in the form of a toolkit, brochure, or fact sheet to support the use of these strategies, citing evidence drawn from the investigation.

9) Compare and contrast in a digital or written artifact the difference in Standard Precautions, personal protective clothing, and personal protective equipment (PPE) in EMS from other healthcare settings. Outline response steps if exposed to hazardous or bloodborne pathogens. Demonstrate donning and doffing of all PPE and the care of soiled equipment or vehicles.

10) Interpret scene management and safety standards and/or protocols by writing a scenario for each of the following situations: (a) traffic or highway incidents, (b) violent encounters, (c) crowds, (d) nature of illness or mechanisms of injury, (e) number of patients and/or victims, and (f) personnel injury prevention. Identify the appropriate responses from EMS professionals and any additional resources that would be involved.

11) Complete the free FEMA Emergency Management Institute's NIMS compliance courses ICS-200 (Single Resources and Initial Action Incidents) and IS-5A (Introduction to Hazardous Materials). Review content from the IS-700, IS-800, and ICS-100 tests. Create and role play scenarios that involve each of the situations described in the FEMA courses identifying the roles and responsibilities of the EMR and other team members.

EMS and Therapeutic Communications

12) Identify situations and locate agencies an Emergency Medical Responder (EMR) would call for additional assistance upon arrival at a scene. Practice scenarios that would require the transfer of care of the patient, incorporating pertinent information such as the patient's condition, history of what happened, care given, etc.

13) Review the concepts of effective therapeutic communication. Examine interview techniques used during therapeutic communication and identify potential hazards of interviewing.

Legal/Ethical Guidelines

14) Interpret the rules, guidelines, and legal ramifications related to incident documentation by EMS staff. Complete a pre-hospital care report utilizing appropriate medical terminology and the acronyms SAMPLE, DCAP-BTLS, and OPQRST

15) Summarize the Health Insurance Portability and Accountability Act (HIPAA). Explain characteristics of consent, confidentiality, advanced directives, living wills, durable power of attorney, and other legal directives governing medical treatment. Using domain-specific language and accurate definitions of legal concepts, explain how the content of these legal documents impacts patients' rights for all aspects of care.

16) Examine real-world situations that involve ethical dilemmas and the application of correct professional conduct as highlighted in recent news articles. Craft an argumentative essay making a claim about the importance of ethics and professional standards for persons working in Emergency Medical Services occupations. Cite examples from case studies to argue for the relevance of professional codes of conduct within scope of practice and how important it is to follow those guidelines.

17) Research legal ramifications and responsibilities of the EMR associated with evidence preservation and mandatory reporting requirements within the EMS system. Identify the process for reporting specific situations to the appropriate authorities, such as child abuse and/or crimes.

Patient Assessment/Evaluation and Treatment

18) Accurately perform the components of patient assessment to identify and manage immediate life threatening illnesses and injuries within the scope of practice of the EMR for pediatric, adult, and geriatric patients, utilizing rubrics from textbooks, National HOSA guidelines, or clinical standards of practice. Include the following areas:
    a. Scene Size-up
    b. Primary Survey or Assessment
    c. History Taking
    d. Secondary Assessment
    e. Vital Signs
    f. Reassessment

19) Identify and perform skills to manage life threatening illnesses based on assessment findings of a pediatric, adult, and geriatric patient with medical emergencies identifying anatomical structures involved. Utilize rubrics from textbooks, National HOSA guidelines, or clinical standards of practice in the following areas:
    a. Altered mental status
    b. Seizures
    c. Stroke
    d. Gastrointestinal bleeding
    e. Anaphylaxis
    f. Infectious diseases
    g. Diabetes
    h. Psychological emergencies
    i. Chest pain
    j. Poisoning
    k. Respiratory distress/Asthma
    l. Vaginal bleeding
    m. Nosebleeds

20) Use assessment information to recognize shock, respiratory failure or arrest, and cardiac arrest based on assessment findings. Demonstrate the ability to manage the situation while awaiting additional emergency response.

21) Successfully perform American Red Cross or American Heart Association adult, child, and infant Basic Life Support (BLS) cardiopulmonary resuscitation (CPR) for Healthcare Providers or BLS for Prehospital Providers.

22) Research and evaluate National Trauma Triage Protocol. Identify and perform skills to manage life threatening injuries based on assessment findings of a patient with trauma emergencies, identifying anatomical structures involved. Utilize rubrics from textbooks, National HOSA guidelines, or clinical standards of practice in the following areas:
    a. Internal and external bleeding
    b. Chest trauma such as sucking chest wound and impaled objects in chest
    c. Abdominal trauma such eviscerations and impaled objects
    d. Orthopedic trauma such as fractures, dislocations, amputations

e. Soft tissue trauma, burns, dressings, and bandages
f. Head, facial, neck and spine trauma such as head injuries, scalp injuries, and injuries to spine
g. Environmental emergencies such as submersion and exposure to heat and cold
h. Multi-system trauma

23) Recognize and manage life threats based on simple assessment findings for special population patients such as children, the elderly, and maternity patients while awaiting additional emergency response. Utilize rubrics from textbooks, National HOSA guidelines, or clinical standards of practice for the following situations:
    a. Vaginal bleeding in pregnant patients
    b. Signs of labor and delivery
    c. Steps in pre-hospital delivery
    d. Initial care of neonates
    e. Care of mother after delivery
    f. Pediatric respiratory distress, seizures, and Sudden Infant Death Syndrome (SIDS)
    g. Geriatric care
    h. Child, elderly, and domestic partner abuse

24) Discuss developmental and psychological norms for all ages, including pediatric and geriatric patients relating normal vs abnormal psychological response to illness and injury.

Portfolio

Compile and continually update a portfolio of artifacts completed in this course. If pursuing EMR certification or dual enrollment/dual credit hours, document hours spent on activities such as job shadowing or classroom contact with an articulated institution. Upon completion of the course, prepare the portfolio in a professional style to present to appropriate EMS audiences.

The following artifacts will reside in the student's portfolio:

- Career Exploration portfolio
- Skills performance rubrics
- Documentation of job shadowing hours
- Classroom contact hours, if applicable
- Examples of written, oral, or digital presentations
- Short research project documents

Standards Alignment Notes

*References to other standards include:

- National Highway Traffic Safety Administration National Emergency Medical Services Education Standards for Emergency Medical Responders (EMR).
    - All standards are aligned to the National EMS Educational Standards and EMR Instructional Guidelines and approved by the Tennessee Department of Emergency Medical Services.
    - Key for alignment: P-Preparatory, AP-Anatomy and Physiology, MT-Medical terminology, PT-Pathophysiology, LD- Life Span Development, PH-Public Health,

Pharm-Pharmacology, AW-Airway Management, Respirations and Artificial Ventilation, A-Assessment, M-Medicine, S-Shock and Resuscitation, T-Trauma, SP-Special Patient Populations, EM-EMS Operations

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.
- Federal Emergency Management Agency, National Incident Management Systems Emergency Management Institute curriculum

Health Science Education

Primary Career Cluster:	Health Science
Program Manager:	Sloan Hudson, (615) 532-2839, sloan.hudson@tn.gov
Course Code(s):	5998
Prerequisite(s):	None
Credit:	1
Grade Level:	9
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
Programs of Study and Sequence:	This is the first course in all programs of study in the Health Science career cluster.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/content/dam/tn/education/ccte/cte/cte_resource_health_science.pdf

Approved April 10, 2015; Amended April 15, 2016

Course Description

Health Science Education is an introductory course designed to prepare students to pursue careers in the fields of public health, therapeutics, health informatics, diagnostics, and support services. Upon completion of this course, a proficient student will be able to identify careers in these fields, compare and contrast the features of healthcare systems, explain the legal and ethical ramifications of the healthcare setting, and begin to perform foundational healthcare skills. This course will serve as a strong foundation for all of the Health Science programs of study.

Program of Study Application

This is the foundational course in all programs of study in the Health Science career cluster. For more information on the benefits and requirements of implementing these programs in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html

Course Standards

Career Planning

1) Synthesize information found in news media, professional journals, and trade magazines to create a report and/or presentation on the historical evolution of healthcare in the United States. Use a timeline or other graphic to illustrate major contributors and developments linking them with modern health care innovations and practices.

2) Prepare a paper or electronic career profile for at least one occupation in each of the five health science career areas (biotechnology research, therapeutic services, support services, health informatics, and diagnostic services), to be included in the student's health science portfolio. Draw on print and online sources, such as government occupational profiles, and/or interviews with health care professionals to capture at minimum the following:
    a. Job description
    b. Roles and responsibilities
    c. Essential knowledge and skills needed for the career
    d. Programs or paths of study available to reach occupational goals, beginning with high school and proceeding through postsecondary
    e. Required personality traits for the career
    f. Licensure and credentialing requirements
    g. Non-educational job requirements such as physical fitness tests, minimum age, and psychological evaluations
    h. Photographs or digital prints of each career (refer to HOSA Medical Photography guidelines)

3) Summarize professional traits and soft skills (such as leadership, ethical responsibility, and time management) required of healthcare professionals in twenty-first century healthcare systems. Compare professional traits and soft skills to self-identified traits and soft skills determining areas for growth.

4) Define ethics and legal terms related to health care including, but not limited to:
    a. Law
    b. Ethics
    c. Abuse
    d. Assault and Battery
    e. Slander
    f. Libel
    g. False Imprisonment
    h. Malpractice
    i. Invasion of Privacy
    j. Advanced Directives

    Create a chart that includes a definition of the term, and a brief description of how each might be demonstrated in a health care setting. Use the chart in order to participate in a class discussion about notable medicolegal cases.

Healthcare Systems

5) Identify the different types of facilities and options for health care delivery in the United States health care delivery system. Compare and contrast the United States health care delivery system with those of two other countries that have high efficiency scores in healthcare as rated by agencies such as the World Health Organization. Create a report and/or presentation highlighting these comparisons.

6) Differentiate among the methods of payment for healthcare in the United States including private and state or federal insurance. Define insurance terms including, but not limited to premium, deductible, co-pay, and benefit then use these terms to discuss the influence of increased costs on health care decisions made by health care consumers.

Body Function and Structure

7) Break down each body system into a list of organs and describe the function of each system. Identify cavities and quadrants listing organs contained in each. Define homeostasis and illustrate how at least two systems work together to maintain homeostasis.

8) Evaluate factors that impact human growth and development related to the biophysical and mental/cognitive areas of infants, toddlers, school age children, adolescents, and young, middle age, and senior adults. Create an artifact that illustrates how each of these factors contributes to the health and wellness of individuals.

9) Develop a patient health education presentation surrounding one of the following wellness issues: optimal health, exercise and fitness, healthy eating and nutrition, sleep, stress or other mental health issues, drug/alcohol/tobacco use and abuse, body decoration, sexually transmitted infections, or cyber safety. Include signs and symptoms of the behavior and/or disease, major physical concerns associated with it, preventive measures, treatments, and support systems. Include at least three resources.

Infection Control/Medical Microbiology

10) Define chain of infection and provide strategies for how to break each part of the chain to prevent the spread of infection. Conduct a short research project on the effects of practices of sanitation and disinfection on health and wellness, examining the implications for public health. Synthesize findings in a written, oral, or digital presentation, citing evidence from the investigation.

11) Understand the principles of and successfully perform the following skills to prevent or curtail the spread of pathogenic and non-pathogenic organisms:
    a. Hand washing
    b. Gloving

Foundational Healthcare Skills

12) Differentiate between verbal and nonverbal communication and identify common barriers. List specific techniques for effective communication and evaluate how different cultures and generations attach different meanings to various gestures, intonations, and other communication techniques. Model/role-play effective communication techniques for interactions with different cultures and generations.

13) Review health topics surrounding complementary and alternative medicine such as acupuncture, biofeedback, and herbal treatments. Develop a public service announcement or academic poster presentation intended to inform consumers or health professionals about the specific topic. Include general information, purported benefits, use in the United States, side effects and/or risks, relevant research, cost, and links to more information. Cite evidence from print and digital resources such as research journals, the National Institute of Health, the Mayo Clinic, and Medline Plus.

14) Understand principles of and successfully perform skills related to Emergency Medicine, incorporating rubrics from the American Heart Association or American Red Cross for the following:
    a. Basic First Aid care of bleeding and wounds
    b. Basic First Aid care for burns
    c. Basic First aid for bone and joint injuries

15) Understand principles of and successfully perform skills related to Dental Assisting, incorporating rubrics from textbooks or clinical standards of practice for the following:
    a. Identifying teeth using the Federation Dentaire International Numbering System
    b. Demonstrate brushing and flossing techniques

16) Understand principles of and successfully perform skills related to Medical Laboratory Assisting, incorporating rubrics from textbooks or clinical standards of practice for the following:
    a. Obtain a culture specimen and streak an agar plate (this may be simulated on paper)

17) Understand principles of and successfully perform skills related to Medical Assisting and Nursing Assisting , incorporating rubrics from textbooks or clinical standards of practice for the following:
    a. Temperature, pulse, respiration and blood pressure assessment
    b. Weighing an ambulatory patient

18) Understand principles of and successfully perform skills related to Physical Therapy and Athletic Training, incorporating rubrics from textbooks or clinical standards of practice for the following:
    a. Ambulation with crutches or cane
    b. Administering cold applications

19) Understand principles of and successfully perform skills related to the Pharmacy Technician incorporating rubrics from textbooks or clinical standards of practice for the following:
    a. accurately weigh dry compounds using balance or electronic scales
    b. accurately measure liquid using graduated cylinders, pipettes, and/or syringes

20) Understand principles of and successfully perform skills related to the ECG Technician incorporating rubrics from textbooks or clinical standards of practice for the following:
    a. prepare skin for electrode placement
    b. accurately place electrodes for a 5-lead ECG on a chart or on a CPR manikin.

The following artifacts will reside in the student's portfolio:

- Career Exploration portfolio
- Skills performance rubrics
- Documentation of job shadowing hours
- Examples of written, oral, or digital presentations
- Short research project documents
- Examples of public service announcement scripts, community awareness, health education portfolio

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Additional Notes

**Informational artifacts include but are not limited to brochures, posters, fact sheets, narratives, essays, and presentations. Graphic illustrations include but are not limited to charts, rubrics, drawings, and mode

Nursing Education

Primary Career Cluster:	Nursing Education
Program Manager:	Sloan Hudson, (615) 532-2839, Sloan.Hudson@tn.gov
Course Code(s):	6000
Prerequisite(s):	*Health Science* (5998), *Medical Therapeutics* (5999)*, and Anatomy & Physiology* (3251 or 5991*)*
Credit:	1
Grade Level:	11-12
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
Programs of Study and Sequence:	This is the final course in *Nursing Services* program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Students enrolled in this course who wish to pursue the CNA certification shall spend a minimum of 40 hours in a clinical setting. Twenty-four of the 40 hours shall be spent in a long-term care facility, and the remainder can take place in any setting that employs certified nursing assistants. Teachers shall hold an active WBL Certificate provided by the Tennessee Department of Education. For more information, please visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	Certified Nursing Assistant Certified Patient Care Technician
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	This course can only be taught by Registered Nurses. First time teachers shall also attend an 8 hour training provided by the Department of Education. Additional training requirement: Work-Based Learning training and D&S Diversified training

Approved April 10, 2015; Amended April 15, 2016

Teacher Resources:	https://www.tn.gov/content/dam/tn/education/ccte/cte/cte_resource_health_science.pdf

Course Description

Nursing Education is a capstone course designed to prepare students to pursue careers in the field of nursing. Upon completion of this course, a proficient student will be able to implement communication and interpersonal skills, maintain residents' rights and independence, provide care safely, prevent emergency situations, prevent infection through infection control, and perform the skills required of a nursing assistant. At the conclusion of this course students may sit for the Certified Patient Care Technician (CPCT) exam, or if students have logged 40 hours of classroom instruction and 20 hours of classroom clinical instruction, and if they have completed 40 hours of site-based clinical with at least 24 of those hours spent in a long-term care facility through a Department of Health approved program, they are eligible to take the certification examination as a Certified Nursing Assistant (CNA).

Prior to beginning work at a clinical site, students shall be certified in Basic Life Support (BLS) Cardiopulmonary Resuscitation (CPR), and deemed competent in basic first aid, body mechanics, Standard Precaution guidelines, and confidentiality.

Note: In order for students to qualify for the nursing assistant certification examination, the training program shall be approved at least 30 days before the first day of class by the Tennessee Department of Health Nurse Aide Training program staff.

Work-Based Learning Framework

Clinical experiences shall comply with the Work-Based Learning Framework guidelines established in SBE High School Policy 2.103. The TDOE provides a *Personalized Learning Plan* template to ensure compliance with the Work-Based Learning Framework, state and federal Child Labor Law, and Tennessee Department of Education policies, which shall be used for students participating in WBL opportunities. Additionally, this course shall be taught by a teacher with an active WBL Certificate issued by the Tennessee Department of Education and follow policies outlined in the Work-Based Learning Policy Guide available online at https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.

Program of Study Application

This is the capstone course in the *Nursing Services* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html

Course Requirements

This capstone course aligns with the requirements of the Work-Based Learning Framework (established in Tennessee State Board High School Policy), with the Tennessee Department of Education's Work-Based Learning Policy Guide, and with state and federal Child Labor Law.

Course Standards

Work-Based Learning

1) A student will have a Personalized Learning Plan that identifies long term goals, demonstrates how the Work-Based Learning (WBL) experience aligns with the elective focus and/or high school plan of study, addresses how the student plans to meet and demonstrate the course standards, and addresses employability skill attainment in the following areas:
    a. Application of academic and technical knowledge and skills (embedded in course standards)
    b. Career knowledge and navigation skills
    c. 21st Century learning and innovation skills
    d. Personal and social skills

Role and Responsibility

2) Differentiate between the services and careers in a LTC setting identifying the careers within each service. Create an artifact to illustrate the interrelatedness of the care team members that includes the individual services each provide.

3) Distinguish personal and professional characteristics of an employee in a Long Term Care (LTC) facility. Explain the characteristics in the context of the nursing assistant's (CNA) role and relate them to common professionalism expectations, including expectations surrounding attire, accountability, chain of command, scope of practice, resident care plans, the nursing process, productivity and time management, performing duties as assigned while demonstrating ethical behavior.

4) Differentiate and explain professional ethics and legal responsibilities of a CNA in the clinical setting. Analyze legal and ethical issues related to practice in the LTC facility. Accurately explain personal and organizational liabilities associated with these legal and ethical issues. Summarize a CNA code of ethics to prepare for a class discussion on the significance of specific standards and how they relate to the LTC residents' bill of rights.

Residents' Rights

5) Use a LTC residents' bill of rights document to analyze and discuss in a written, oral, or digital artifact**, the importance of maintaining a healthy, safe, and respectful environment that includes families and friends. Address at minimum the following components: obligation of staff to inform resident and their families of rights and services, right to privacy, right to participate in own care, right to independent choice, and informed consent. The following rights should be included for LTC residents: avenues for dealing with disputes and/or grievances, residents' environment and quality of life, and maintaining care and security of residents' personal possessions.

6) Summarize the Health Insurance Portability and Accountability Act (HIPAA). Create a digital or written artifact that differentiates the characteristics and rights of residents from advanced directives, living wills, durable power of attorney, and other legal directives governing medical

treatment in a LTC setting. Discuss how the content of these legal documents influences residents' rights in a long-term care facility for all aspects of care.

7) Define the terms abuse and neglect, and differentiate among various types of abuse and neglect through an evaluation of scenarios. Document findings from the scenarios, including all suspicious findings and actual signs of abuse and/or neglect. Accurately summarize the findings, citing evidence from documentation.

8) Describe the purpose of the Omnibus Reconciliation Act (OBRA) and explain key concepts in an informational artifact that can be used when teaching new residents and/or their families. Key concepts can include, but are not limited to:
    a. Importance of an individualized plan of care for each resident
    b. Minimal requirements for nursing assistant training
    c. Long Term Care Minimum Data Sets (MDS) guidelines
    d. Roles of Ombudsmen
    e. Purpose and importance of Patient Self-Determination Act

Safety

9) Accurately read and interpret policies and procedures for the following safety subjects aligned to the roles and responsibilities of a CNA. Participate in a facility safety training and apply the safety procedures in the classroom and clinical setting in order to prevent injury and provide safety for residents. Document completion of training topics on the appropriate work-based learning (WBL) and work site forms.
    a. Proper identification of patient
    b. Body mechanics
    c. Fire and oxygen safety
    d. Natural disasters
    e. Chemical safety
    f. Physical and mental restraints
    g. BLS for Health Care Providers
    h. Safe use of mechanical lift

10) Identify physical and mental changes in the elderly that increase their risk for accidents including falls. Create a chart that aligns types of risks with their signs and symptoms and the prevention guidelines that preserve LTC residents' rights. Use the chart as an observation tool for identifying risk situations in the clinical setting.

Infection Control/Medical Microbiology

11) Review infection control guidelines, Standard Precaution guidelines, Transmission-Based precautions, Personal Protective Equipment use, and infection control. Practice skills related to hand washing, donning and doffing a gown, masks, gloves and goggles, handling and cleaning spills, cleaning equipment, and handling laundry.

12) In a written or digital format, synthesize research into a coherent representation of the signs/symptoms (s/sx), causative agents, and precautions and preventive measures for the following infectious diseases frequently encountered in a LTC facility:
    a. Tuberculosis
    b. Hepatitis
    c. Methicillin-resistant Staphylococcus aureus (MRSA)
    d. Vancomycin-Resistant enterococcus (VRE)
    e. Clostridium difficile or C. diff
    f. Other nosocomial infections

Communication

13) Examine the skills needed to effectively and respectfully communicate with an LTC resident. Discuss the following facets of communication:
    a. Integration of interpersonal skills,
    b. Verbal and nonverbal communication,
    c. Barriers to communication,
    d. Special needs or cognitive impairments,
    e. Cultural diversity,
    f. How to respond to negative or changing behaviors,
    g. How to respond to grief, and
    h. How to handle discussions about death and dying.

    Practice communication skills in the classroom and LTC setting with classmates, families, the elderly, and persons with special needs, obtaining objective and subjective patient information.

14) Research guidelines and formats pertaining to nursing assistant documentation in a LTC facility. Interpret domain-specific words and phrases that are used in documentation, especially in regards to legal requirements and correct medical terminology. Role-play giving and receiving a resident/patient status report using the documented information.

Personal Care, Data Collection, and Care Impaired

15) Understand principles of and successfully perform skills related to personal care. Incorporate guidelines for LTC residents' rights and utilize rubrics from textbooks, National HOSA guidelines, or other clinical standards of practice for the following:
    a. Principles of self-care versus full care
    b. Bathing/skin care/back rub
    c. Grooming/shaving/hair care/nail care
    d. Mouth care/denture care of conscious and comatose resident
    e. Dressing
    f. Transfers, positioning, turning in bed
    g. Bed making, occupied and unoccupied
    h. Care for resident/patient when death is imminent

16) Understand principles of and successfully perform skills related to toileting, intake and output, and bedpan or bedside commode use. Incorporate guidelines for LTC residents' rights and utilize rubrics from textbooks, National HOSA guidelines, or other clinical standards of practice for the following:
    a. Urine characteristics, and abnormalities that should be reported to the charge nurse
    b. Common disorders of bladder and bowels
    c. Factors affecting elimination of urine or stool
    d. Types of urine specimens obtained
    e. Catheter care/emptying urinary bag
    f. Procedure for collecting urine and stool specimens
    g. Care guidelines for ostomy
    h. Recording intake and output

17) Understand principles of and successfully perform skills related to basic restorative care. Incorporate guidelines of LTC residents' rights and utilize rubrics from textbooks, National HOSA guidelines, or other clinical standards of practice for the following:
    a. Promoting self-care
    b. Range of Motion (ROM) exercises and maintenance
    c. Ambulation with and without assistive devices
    d. Use of assistive devices in transferring, eating, and dressing
    e. Care and use of prosthetic/orthotic devices

18) Understand principles of and successfully perform skills related to proper feeding techniques to assist with eating and hydration. Incorporate guidelines of LTC residents' rights and utilize rubrics from textbooks, National HOSA guidelines, or other clinical standards of practice for the following:
    a. Nutritional needs of the elderly
    b. Factors that influence food preference
    c. Special diets
    d. Thickened liquids
    e. Swallowing issues and dysphagia
    f. Abdominal thrust per American Heart Association or American Red Cross standards
    g. Reporting food intake

Basic Nursing Skills and Disease Process

19) Assess vital signs to determine oral temperature, radial and apical pulse, respirations, blood pressure, height, and weight. Calculate body mass index (BMI). Identify acceptable ranges for adult and geriatric patients, as well as the measurements that shall be reported to the nurse, including possible causes. Document assessment finding on a classmate or resident's chart at least ten times during the semester.

20) Articulate CNA standards for the care of a LTC resident who is receiving oxygen therapy. Be able to discuss the reasons for oxygen therapy, types of therapy, types of devices, and safety precautions. Demonstrate these standards of care in the classroom and clinical setting.

21) Shall compare and contrast the quality of life of LTC residents with and without pain. Discuss measures a CNA may use to reduce pain and signs/symptoms to report to the nurse including the use of a pain scale. Demonstrate pain reducing measures in the classroom and the clinical setting.

22) Outline the specific changes that occur in each system of the body with geriatric clientele. Create an easy access geriatric field guide with common disease/disorders including signs and symptoms for this population and key reportable information. Using a chosen geriatric patient or mock patient, create a nursing care plan with a nursing diagnosis, intervention and rationale for each of the following systems. Interventions should be appropriate for a CNA to use in a clinical setting.
    a. Integumentary systems
    b. Nervous system with eye and ears
    c. Musculoskeletal systems
    d. Cardiovascular and respiratory systems
    e. Digestive and urinary systems
    f. Endocrine systems

23) Outline potential medical emergencies within an LTC facility, including but not limited to those related to shock, Myocardial Infarction (MI), bleeding, burns, fainting, diabetes, Cardiovascular Accident (CVA), and seizures. Generate a plan and/or guidelines of care for each of the areas previously listed, incorporating facility policies, national standards, and any other resource necessary.

Mental Health and the Aging Process

24) Investigate mental health diseases in the elderly and compare their challenges to those faced by middle adults in Erikson's psychosocial developmental stage. Create an artifact that includes signs and symptoms, incidence, how the disease/disorder affects the resident and/or family, how to modify staff behavior in response to residents' behavior, and possible treatments. Use this artifact to prepare for participation in a post-clinical conference.

25) Describe therapies or strategies for addressing the unique needs of cognitively impaired residents and modifying behavior in a positive manner. Model strategies in classroom role plays and in interactions with patients in the clinical setting for the following:
    a. Developmental task of aging,
    b. Methods to reduce the effects of cognitive impairment,
    c. Attitudes of staff caring for cognitively impaired residents,
    d. Communication with cognitively impaired residents,
    e. Methods to reduce effects of cognitive impairment
    f. Acceptable interventions associated with cognitive disorders and behaviors.
    g. Safe management of a combative resident
    h. Acceptable interventions associated with sundowners and wandering

Portfolio

26) Compile and continually update a portfolio of artifacts completed in this course. If pursuing Nursing Assistant certification or dual enrollment/dual credit hours, document hours spent on activities such as clinical placement or classroom contact with an articulated institution. Upon completion of the course, prepare the portfolio in a professional style to present to an appropriate nursing audience.

The following artifacts will reside in the student portfolio:

- Skills performance rubrics
- Documentation of long-term clinical hours
- Documentation of classroom clinical hours
- Examples of written, oral, or digital presentations
- Job applications
- Resumes
- Mock or actual job interviews

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.
- Nurse Aide Training Program requirements for Tennessee
    - These are the minimum requirements that all programs shall include in order for students to be eligible to take the competency evaluation to become a Certified Nursing Assistant.

Additional Notes

**Artifacts can include, but are not limited to, brochures, posters, fact sheets, narratives, essays, and presentations. Graphic illustrations can include, but are not limited to, charts, rubrics, drawings, and models.

Rehabilitation Careers

Primary Career Cluster:	Health Science
Program Manager:	Sloan Hudson, (615) 532-2839, sloan.hudson@tn.gov
Course Code(s):	5990
Prerequisite(s):	*Health Science Education* (5998)
Credit:	1
Grade Level:	10-11
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses.
Programs of Study and Sequence:	This is a second or third course choice in the *Sport and Human Performance* program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Pamela Sieffert, (615) 532-6270, Pamela.Sieffert@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/content/dam/tn/education/ccte/cte/cte_resource_health_science.pdf

Approved April 10, 2015; Amended April 15, 2016

Course Description

Rehabilitation Careers is an applied course designed to prepare students to pursue careers in rehabilitation services. Upon completion of this course, a proficient student will be able to identify careers in rehabilitation services, recognize diseases, disorders or injuries related to rehabilitation services and correlate the related anatomy and physiology then develop a plan of treatment with appropriate modalities.

Implementation options are as follows:

- Option 1: Rehabilitation Careers taught as a Level Two course
- Option 2: Rehabilitation Careers taught as a Level Three course

Core standards are required for both options above.

Core Standards: 1,2,3,4,5,6,7,8,10,11,12,15,16,17,18,19,20,21,22,23,24,25,26
Additional standards:
Option 1: 9,13
Option 2: 14

Program of Study Application

This is the second or third course in the *Sport and Human Performance* program of study. For more information on the benefits and requirements of implementing these programs in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html

Course Standards

Careers

1) Research careers within the Rehabilitation career pathway in Athletic Training, Physical Therapy, Occupational Therapy, Speech Therapy, Music Therapy, Pet Therapy, Exercise Therapy, Message Therapy, Chiropractic Medicine and Recreation Therapy. Explain in detail the educational/credentialing requirements, professional organizations, and continuing education unit requirements necessary for success in these fields, as well as state and national compliance guidelines required of Rehabilitation professionals.

2) Investigate and compare the range of skills, competencies, and professional traits required for careers in the Rehabilitation careers pathway. Using real-time and projected labor market data, identify local and national employment opportunities and determine areas of growth in rehabilitation careers.

3) Compare and contrast the specific laws and ethical issues that impact relationships among patients/clients and the healthcare professional, and debate these issues in an oral or written format. Include issues such as codes and standards of practice.

4) Summarize the Health Insurance Portability and Accountability Act (HIPAA) and other legal directives regarding medical treatment and analyze their impact on patient rights. Include

confidential information shared concerning minor athletes and/or patients with someone other than parents.

Healthcare Systems

5) Calculate the costs of a range of health insurance plans, including deductibles, co-pays, PPO's and HMO's. For a selected disease/disorder/injury, predict the total cost (including but not limited to the diagnostics, procedures, and medications involved), allowable reimbursement, and actual reimbursement under each of these plans for the course of the treatment.

6) Investigate current issues and practices surrounding assessment and treatment of clients seeking rehabilitation services such as athletes, military personnel, or patients recovering from surgery or trauma. Demonstrate understanding and application of major legislation and policy affecting patient/client interaction by determining the central idea or conclusion of a text. Construct an argumentative essay explaining the identified issue, any legislation and outcomes. Include both claims and counterclaims equally.

7) Gather information on the history and development of physical therapy, occupational therapy, speech therapy, and athletic training, including but not limited to significant changes in the profession, major contributors to the field, and impactful practices that were developed. Document findings from print and digital professional journals, rehabilitation career related websites, and textbooks in an oral, visual, digital, or paper product with proper citations.

8) Evaluate factors that contribute to effective patient/client communication, demonstrating sensitivity to barriers, cultural differences, and special needs individuals. Apply effective practices within a lab/clinical setting.

Anatomy and Physiology

9) Outline the gross and cellular anatomy and physiology of the musculoskeletal, neurological, and cardiovascular systems. Review the gross anatomy of the other systems studied in previous courses.

10) Investigate the basic principles of kinesiology and relate in an informational paper, brochure, or presentation the connection to disease/disorder prevention. Address at minimum: movements of joints and bones, planes, directional terms, body motions, motions between joint articular surfaces, mechanisms of joints and biomechanical levers.

11) Compare and contrast physiological responses of patients of differing ages, current health status, and presence of acute and/or chronic diseases. For example, compare the response of a healthy elderly patient with a fractured femur to an overweight adolescent with the same fracture. Explain how one would differentiate treatment to meet varying conditions.

12) Describe the physiological and pathological processes of trauma, wound healing, and tissue repair, and evaluate their implications on the development, progression, and implementation of a therapeutic exercise regimen. For example, examine a post-operative cardiac patient undergoing cardiac rehabilitation.

13) Identify signs and symptoms as well as pathophysiology for the following injuries/diseases/disorders as they are connected to Rehabilitation Careers. Relate who the appropriate professional would be to provide the care:
    a. Acute inflammation related to an injury
    b. Shock
    c. Communicable diseases, such as pertussis or influenza
    d. Adverse reaction to environmental conditions, both heat and cold
    e. Open and closed wounds
    f. Asthma
    g. Neurological disorders such as stroke, dizziness, and/or vestibular disorders
    h. Orthopedic conditions
    i. Speech disorders and/or swallowing disorders
    j. Work- or sports-related injuries
    k. Ambulation or gait difficulties
    l. Concussions
    m. Soft Tissue Injuries

14) Identify signs and symptoms as well as normal anatomy and physiology versus pathophysiology for the following injuries/diseases/disorders as they are connected to Rehabilitation Careers. Relate who the appropriate professional would be to provide the care:
    a. Acute inflammation related to an injury
    b. Shock
    c. Communicable diseases, such as pertussis or influenza
    d. Adverse reaction to environmental conditions, both heat and cold
    e. Open and closed wounds
    f. Asthma
    g. Neurological disorders such as stroke, dizziness, and/or vestibular disorders
    h. Orthopedic conditions
    i. Speech disorders and/or swallowing disorders
    j. Work- or sports-related injuries
    k. Ambulation or gait difficulties
    l. Concussions
    m. Soft Tissue Injuries

Evaluation and Treatment

15) Describe evidence-based techniques and procedures for evaluating common medical conditions, disabilities, and injuries. Discuss at minimum the procedures surrounding inspection/observation, palpation, testing of flexibility, endurance, and strength, special evaluation techniques, and neurological testing. Role-play practicing these skills on a classmate and/or family member, or within in a lab/clinical setting.

16) Define the basic components of injury-specific rehabilitation goals, functional progress, and outcomes in a therapeutic exercise regime. Apply these concepts to a specific case; for example, outline standard goals for a patient who is aphasic.

17) List and define the goals, indications, contraindications, and various techniques of therapeutic exercise, including both general and specific exercise regimes relative to treatment of soft tissue, bony, neurological disorders/diseases, and post-surgical complications.

18) Describe the indications, contraindications, theory, and principles for the incorporation and application of therapeutic exercise equipment and techniques, including but not limited to: continuous passive motion machine, aquatic therapy, manual therapy, adaptive therapeutic techniques, and/or assistive devices and mobilization.

19) Describe common surgical techniques and relevant anatomical alterations that may affect the implementation of a therapeutic exercise regime.

20) Using appropriate medical language and terminology, interpret objective and subjective data obtained in standard 13 or 14 in developing an appropriate therapeutic treatment plan for a given injury, disease, or disorder, including determination of goals and objectives in order to return the patient to maximum level of performance based on level of functional outcomes.

Patient Interaction

21) Understand and successfully practice or evaluate the following treatment modalities with identification of appropriate equipment and inclusion of sanitation methods, universal precautions, and proper body mechanics.
    a. Passive and Active Range of Motion exercises
    b. Gait training with assistive devices
    c. Cryotherapy, elevation, and compression
    d. Hydrotherapy
    e. Heat therapy
    f. Electrostimulation (such as e-stim, TENS, or Ultrasound)
    g. Wound care with or without external hemorrhage
    h. Extrication and transport of athletes
    i. Normalization of body temperature in extreme heat or cold environments

22) Summarize in an informational paper, brochure, or digital presentation the specific symptoms and proper responses to life-threatening events such as shock, brain injury, and spinal cord injury in athletes.

23) Adhering to industry standards and using appropriate medical terminology, document the findings from evaluation, treatment plan, and progress in the therapeutic exercise regime related to a disease or disorder examined in standard 20 or 21.

Prevention of Injuries

24) Identify the basic concepts of wellness screening in connection to injury prevention. Complete an injury prevention assessment in a lab/clinical setting.

25) Explain and demonstrate the effectiveness of taping, wrapping, bracing, and use of other supportive/protective devices in preventing exacerbation of injury, disease, or disorder in a lab/clinical setting.

26) Develop a patient health education plan for a real or imagined person that describes recommended preventive measures, signs and symptoms of exacerbation of disease/disorder/injury, pharmacological needs, and support systems to ensure safe and speedy recovery. Incorporate and properly cite information from at least three authoritative sources such as textbooks, digital or print healthcare journals, or interviews with related healthcare professionals. Examples of possible topics include effective heat loss and heat illness prevention, work back injury prevention, reaching and maintaining optimal weight, safe and effective physical activity, and use of pet, recreation, or music therapy in autistic children.

The following artifacts should be included in the student's portfolio:

- Career exploration artifacts
- Skills performance rubrics
- Documentation of job shadowing hours
- Examples of written, oral, or digital presentations

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Entrepreneurship

Primary Career Cluster:	Marketing
Consultant:	Sarah G. Williams, (615) 253-7442, Sarah.G.Williams@tn.gov
Course Code(s):	5934
Prerequisite(s):	*Marketing & Management I: Principles* (5931)
Credit:	1
Grade Level:	11-12
Graduation Requirements:	Completion of one credit of *Entrepreneurship* satisfies the *Economics* requirement for graduation. This course satisfies one of three credits required for an elective focus when taken in conjunction with other Marketing courses.
Programs of Study and Sequence:	This is the third course in the *Entrepreneurship* program of study.
Aligned Student Organization(s):	DECA: http://www.decatn.org FBLA: http://www.fblatn.org Steven Mitchell, (615) 532-2829, Steven.Mitchell@tn.gov
Coordinating Work-Based Learning	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Industry Certifications	None
Dual Credit or Dual Enrollment	There are currently dual credit opportunities available for this course at specific community colleges. Contact a local postsecondary institution(s) for more information.
Teacher Endorsements	030, 035, 039, 052, 054, 152, 153, 158, 202, 204, 311, 430, 435, 436, 471, 472, 474, 475, 476
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-marketing.html.

Course Description

Entrepreneurship is an applied knowledge course that begins with the discovery process of generating new business ideas. Students research local, national, and international social and economic trends and analyze the feasibility of their own proposed businesses, both from a market demand and revenue-producing standpoint. Based on their entrepreneurial endeavors, students will prepare, write, and revise a business plan. In preparation for the business plan, students will conduct market research, study ownership structures, evaluate risks, examine startup costs, determine essential vendors, and identify sources of capital and financing options. Students will also draft, refine, and rehearse entrepreneurship pitches developed from their business plans to present during course intervals and to give final presentations at the conclusion of the course. Upon conclusion of this course, proficient students will be able to articulate, and defend, elements of a full business plan for a new business.

Program of Study Application

This is the third course in the *Entrepreneurship* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Marketing website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-marketing.html.

Course Standards

This course is designed to provide a comprehensive outline and development of the necessary segments of a business plan for a startup venture. Standard 5 can be used to drive brainstorming and critical thinking to identify a potential business startup idea that students will continue to develop throughout the course. Students can approach this course individually or in teams, depending on background, knowledge and skills, and quality of business idea(s). Standards 6-17 should focus on the selected business startup idea and should be approached as parts of a larger whole rather than separate projects.

The Role of Entrepreneurs

1) Define the term *entrepreneur* and describe the key components of the entrepreneurial startup process (the entrepreneur, the environment, the opportunity, startup resources, and the new venture organization). Prepare an informative text to explain each component and identify the risks and rewards encountered in an entrepreneurial endeavor, highlighting the advantages and disadvantages of owning a business versus working for someone else.

2) Evaluate the role of entrepreneurship in the U.S. economy, and describe the expansion and growth of entrepreneurship in the current decade. Draw evidence from informational texts to examine how business cycles, economic indicators (i.e., interest rates, inflation, and unemployment) and free enterprise system characteristics such as profit motive, private property, and competition impact entrepreneurial decision making.

3) Research the backgrounds and business ventures of successful entrepreneurs to draw conclusions about the personal traits, experiences, and behaviors associated with entrepreneurship, including professional values and specific skills. Compare findings to personal strengths to assess potential for becoming a successful entrepreneur by

completing an entrepreneurial characteristics assessment and self-evaluation. Using the results of the self-assessment, identify areas of strengths and weaknesses and choose characteristics to develop. Prepare a written plan to further educational attainment, develop new skills, or seek work experience to develop identified skills.

4) Building on the research in Standard 3, select a well-known entrepreneur and summarize his/her strongest entrepreneurial characteristics, major business venture, and the problem the entrepreneurship sought to address with his/her venture. Analyze and cite any unique contributions to the U.S. economy or culture associated with the entrepreneur's endeavors. Make connections between information gathered during research and personal reflection from Standard 3.

Entrepreneurship Potential

5) Review news media and labor projections to identify current and projected trends in social and/or economic development, including but not limited to: web-based businesses, customer privacy, green businesses, social entrepreneurship, and more. In teams or individually, compile a list of potential ideas that have commercial potential not currently being met by existing businesses.

6) Analyze domestic and international opportunities for entrepreneurial ventures. Use the International Trade Statistics Yearbook of the United States, or other reliable sources, to research and locate the best global markets for a given product. Identify financial export assistance programs that U.S. government agencies and investment corporations offer; prepare a mock application for assistance following procedures and requirements.

Social and Ethical Responsibility

7) Examine different examples of business codes of ethics. Synthesize principles from the research, highlighting ethical problems typical for entrepreneurs such as conflicts of interests, bribes, and patent/copyright infringement. Create a written code of ethics for the proposed business.

8) Explore the growth of social responsibility in capitalism by reviewing news reports and journal articles about social entrepreneurship ventures. Create an informative text to define the term "conscious capitalism" and summarize how it is a growing business model for entrepreneurship.

Business Plan Development

9) Prepare a presentation identifying at least three government or private agencies available for assistance to entrepreneurs and small business owners, to encompass services offered by each agency.

10) Write, review, and revise a business plan for a potential entrepreneurial endeavor. The plan should include: an executive summary, company description, vision and mission

statements, industry overview, market analysis, marketing plan, operations plan, and financial plan.

11) Construct a market research project for the identified endeavor. Develop a research question, then determine, develop and conduct the appropriate research (primary research, secondary research, scientific method) to achieve the desired analysis. Summarize results of the research in recommendations in the business plan overview and market analysis.

12) Develop a customer profile with a detailed description of the potential target market for the proposed business based on demographic, geographic, psychographic, and behavioral information. Assess the viability of the profile for the proposed business by determining number of customers, reachability, and desire for product. Include these findings in the business plan's overview and market analysis section.

Marketing

13) Prepare a brief outline of the proposed business' marketing plan including pricing, promotion, and service/product planning in the development of customer relationships. Explain multiple pricing, promotions, and product selection strategies for the proposed business. Summarize how one or all of these strategies can directly impact a customer's experience.

14) Enhance the marketing plan with a proposal for attracting early adopters to the proposed product or service. Include ideas for preopening with the following objectives: establishing image, advertising methods, customer contact and interaction, generating appeal, and follow-up. Make a claim about the correct proportions of the marketing mix, supporting claim with data and evidence and addressing counterclaim(s) about alternative methods.

Operations

15) Compare and contrast the different ownership options for the proposed business. Identify the legal regulations required for the type of ownership selected. Prepare a sample partnership agreement or Doing Business As (DBA) document that outlines the division of assets, rights, and responsibilities of each owner.

16) Investigate channel management and distribution methods for the proposed product or service. Research possible manufacturers; study distribution considerations of the product or service, (including transportation, storage, handling, and packaging for products or staffing, training, and evaluation for services); cite justification for the channel management decisions, such as cost-saving benefits to the business' bottom line. Prepare a sample service contract with a potential vendor for first year of business.

Financials

17) Examine startup costs, operating costs, overhead, and personal expenses by researching and developing a financial statement based on models obtained from public records or

business websites. Contact local lending institutions regarding requirements for business loans and needed documentation such as personal income statement, tax records, credit reports, loan history, and personal investment. Prepare financial statements and charts and graphs for the proposed business plan, including but not limited to:

a. Estimated start-up costs
b. Projected Income Statement
c. Projected Balance Sheet
d. Cash Flow

Create a pro forma projection of a. – d. above. Establish length of view, i.e. first year, 3-year, 5-year timelines. Generate a breakeven analysis.

18) Investigate potential sources of startup capital needed to secure financing (e.g. equity financing, personal savings, angel investors, partnerships, venture capitalists, and debt financing) and list advantages and disadvantages of each. Visit or research local banks, entrepreneurship centers, or incubators to determine the most common reasons investors decline to invest in order to ensure business plan addresses typical concerns.

19) Prepare a "pitch" to explain the business to a potential investor, including breakdown of necessary financing and requested terms. Justify requested funding, using financial figures with appropriate data and evidence from coursework. Evaluate potential financing offers that may be different from requested terms. Based on the evaluation, choose to either accept or not accept the proposal. For example, based on startup costs needed and future valuation, pitch a request for $100,000 to a potential investor in return for a 25% stake in the proposed business. Then evaluate whether or not to accept a counteroffer of a proposed $100,000 for a 50% stake.

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

Social Media and Analytics

Primary Career Cluster:	Marketing, Distribution, and Logistics
Consultant:	Sarah G. Williams, (615) 253-7442, Sarah.G.Williams@tn.gov
Course Code(s):	5932
Prerequisite(s):	*Marketing & Management I: Principles* (5931)
Credit:	1
Grade Level:	11 - 12
Graduation Requirement:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Marketing courses.
Programs of Study and Sequence:	This is the third course in the *Social Media Marketing* program of study.
Aligned Student Organization(s):	DECA: http://www.decatn.org Steven Mitchell, (615) 532-2829, Steven.Mitchell@tn.gov
Coordinating Work-Based Learning:	Teachers who hold an active WBL certificate may offer placement for credit when the requirements of the state board's WBL Framework and the Department's WBL Policy Guide are met. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html
Available Student Industry Certifications:	Hootsuite Platform Certification Hootsuite Social Marketing Certification
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	030, 035, 052, 054, 152, 153, 158, 202, 204, 311, 430, 435, 436, 471, 472, 474, 475, 476
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-marketing.html.

Course Description

Social Media Marketing & Analytics is a study of concepts and principles used in social media marketing. Students will examine the uses, marketing strategies and data generated by social media marketing. Subject matter includes foundational social media knowledge, social media marketing strategies, communication, and ethical responsibilities.

Program of Study Application

This is the third course in the *Social Media Marketing* program of study. For more information on the benefits and requirements of implementing this programs in full, please visit the Marketing website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-marketing.html

Course Standards

Foundations and History

1) Explain the purpose and use of social media for business and personal use. Describe the importance of using social media to support a company's or an individual's brand.

2) Identify different social media platforms (Instagram, Twitter, LinkedIn, etc.) used for marketing and discuss challenges (such as target markets, limited exposure, time constraints, etc.) associated with each. Create an infographics explaining the similarities and differences for each social media platform.

3) Research the Digital (Social Media) Revolution. Identifying key dates and activities that contributed to the digital/social media landscape when compared to the Industrial Revolution. Produce a 30-second video that highlights the impact on customer interactions with businesses.

4) Research social trends and perspectives (videos, QR codes, cloud technology, augmented reality, live streaming, etc.). From a business and cultural perspective, identify at least two trends that affected the marketplace. Prepare a presentation outlining the historical aspect of the trend and the impact on the marketplace.

5) Analyze the 4 C's of social media marketing (content, context/conversation, community, connection). Select a product or service to construct a visual representation with details and examples illustrating each of the four C's.

Social Media Marketing

6) Describe how a business' image is created and/or enhanced through social media; explain the importance of social media to a business' overall image. Using online resources, complete a social media audit for a WBL partner, another local business, or a local CTSO chapter, to include the following:
    a. Audience analysis
    b. Internal audit
        i. List all social media platform accounts
        ii. Identify posting frequency, follower counts, engagement rates, referral traffic
    c. Competitor audit
        i. Gather basic metrics
        ii. What content is out performing your selected company's content?
        iii. Identify aspirational brands, optional.

7) Using the social media audit in standard 13, write a report for the selected WBL partner, another local business, or your CTSO chapter including :
    a. A SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of the company's social media presence.

b. Recommendations for at least two future social media marketing SMART (Specific, Measurable, Attainable, Relevant and Time-based) goals which include at least 2 objectives each.
c. Annotated list of tactics to be used to reach goals
d. Annotated list of tools necessary to reach goals
e. A budget for future social media marketing campaigns.

8) Research an example of a social media promotion (e.g. Ice Bucket Challenge, Planking, #InMyFeelings). Construct an essay highlighting
   a. social media tools that were leveraged
   b. factors that contributed to the launch of the promotion and its continued existence
   c. Identify the outcome of the social media promotion.

   Include an executive summary with the following:
   a. name the company sponsor
   b. identify any nonprofit benefactors
   c. PEST analysis (political/legal, economic, sociocultural, and technological)

9) Identify and research a business with a strong social media marketing presence (eg. Warby Parker, Smile Direct). Summarize how the company's social media promotions contribute to personal sales in establishing and maintaining customer relationships. Utilizing the appropriate steps of a sale, prepare a sales presentation to a customer whose first experience with the company was through social media marketing, but is now reaching out to the company to purchase an item.

10) Identify five companies that utilize social media to engage with customer compliments, complaints and comments. Evaluate company response times to customer feedback via social media platforms. Develop a strategy for a WBL partner or another local business to develop brand loyal customers with post visit interactions via social media platforms.

Effective Social Media Communication

11) Identify, analyze, and critique the basic components of communications, such as the message, the sender, the receiver, the mode, the noise, and the response. This includes conducting responsible research when necessary, developing effective arguments, composing meaningful and coherent messages appropriate to the intended audience, and polishing one's delivery skills to deliver an effective and credible message, followed by listening.

12) Analyze examples of writing for evolving digital platforms such as social media applications. Compare and contrast writing conventions required for commonly used applications and construct an event announcement for a local business in formats appropriate for at least three different social media/networking tools.

13) Brainstorm content for use on social media for a WBL partner, local business or CTSO. Design a six-month social media calendar for the WBL partner or another local business. Include all elements of the promotional mix. Identify:

a. Goals
b. Target market
c. Message or theme
d. Coordination aspects
e. Action plan/implementation
f. Evaluation instrument

14) Using the calendar created in standard 13, write promotional content to be used on social media, repurpose the original message/post for use on at least two other social media platforms (Instagram, Twitter, LinkedIn, etc.) to engage secondary target markets.

Social Media Analytics

15) Using validated online texts, research and summarize the difference between social media analytics and social media listening. Using the Social Metrics Map, establish at least two objectives and develop at least two social media activities to meet the objectives of a WBL partner, a location business or your CTSO chapter.

16) Using online journals and resources, research the best times to post on at least three different social media platforms. Write a report detailing optimal day(s) of week, time of day, and social media platforms to use when trying to reach specific target markets.

Ethics and Responsibility

17) Research your school's or CTSO's ethics policy regarding copyrighted materials, plagiarism, authenticity, proper citations, privacy, and proper use of technology resources. Develop at least five social media posts to be used to raise awareness for CTSO competitive events expectations.

18) Research and create an annotated list of federal statutes encompassing consumer privacy practices that can affect social media marketing.

19) Determine technology security strategies needed to protect customer information and company image. Evaluate strategies for protecting business' digital assets (e.g., website, social media, email, etc.), customer data, and other protected information.

Careers in Social Media Marketing

20) Conduct a job search of positions in one or more career areas of interest using tools such as https://www.jobs4tn.gov and other online employment resources; complete a job application; participate in mock interviews with partner businesses and/or through participation in a student organization event.

21) Prepare an electronic portfolio packaged on a suitable media (e.g. web site, cloud based storage, etc.), including:

a. Work products demonstrating career preparation skills, using an assortment of media (text, photos, video, hyper-linked pages).
b. A professionally formatted résumé and other supporting documents such as cover letter and application.
c. Personal social media audit.

22) Address the appropriate use of and ethics related to social media in personal and professional situations and its impact on career search processes, as well as its impact on the professional reputation of a person.

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

BioSTEM I

Primary Career Cluster:	Science, Technology, Engineering, and Mathematics (STEM)
Program Manager:	Deborah Knoll, (615) 532-2844, Deborah.Knoll@tn.gov
Course Code(s):	
Prerequisite(s):	None
Credit:	1
Grade Level:	9
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other BioSTEM courses.
Programs of Study and Sequence:	This is the first course in the BioSTEM program of study
Aligned Student Organization(s):	SkillsUSA: http://www.tnskillsusa.com Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov Technology Student Association (TSA): http://www.tntsa.org Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://tn.gov/education/topic/work-based-learning.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	Dual Credit will be available for BioSTEM I, II, III and IV through Vol State Community College.
Teacher Endorsement(s):	013, 014, 015, 016, 017, 018, 047, 070, 078, 081, 125, 126, 127, 128, 129,157, 210, 211, 212, 213, 214, 230, 232, 233, 413, 414, 415, 416, 417, 418, 449, 470, 477, 519, 531, 595, 596, 700, 740, 760
Required Teacher Certifications/Training:	Teachers who have never taught this course shall attend training provided by the Department of Education.
Teacher Resources:	https://tn.gov/education/article/cte-cluster-health-science

Course Description

BioSTEM I is a foundational course in the STEM cluster for students interested in learning more about careers in science, technology, engineering, and mathematics with emphasis in biotechnology. This course covers basic skills required for BioSTEM fields of study. Upon completion of this course, proficient students are able to identify and explain the steps in both the engineering design and the

scientific inquiry process. Students conduct research to develop meaningful questions, define simple problem scenarios and scientific investigations, develop fundamental design solutions, conduct basic mathematical modeling and data analysis, and effectively communicate solutions and scientific explanation to others.

Program of Study Application

This is a first course in the *BioSTEM* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the STEM website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-stem.html.

Course Standards

STEM Fields Exploration

1) Describe the dynamic interplay among science, technology, and engineering and math within living, earth-space, and physical systems. Differentiate between the terms biotechnology and biomedicine noting the impact that each has had on society. Explore the history and development of these scientific fields, as well as the roles that their associated industries have played in the areas of agriculture and food, health and medicine, the environment, research, and forensics.

2) Explore several occupations within BioSTEM fields such as medical laboratory science, research science, food science, forensic science, and environmental science, and determine how various industries employ different kinds of data to meet their needs. Create an infographic to describe the many sources and types of data that these occupations use.

Perceptions and Future

3) Summarize research from professional journals or websites, textbooks, and/or newspaper articles surrounding an ethical issue related to biotechnology (i.e., the use of animals for lab testing, genetically modified organisms, or stem cell use). Debate the chosen topics presenting both sides of the issue. Discuss the moral, ethical, and legal responsibilities of researchers, policymakers, and other actors as they pertain to informing the public and ensuring the safety and well-being of affected populations.

4) Develop an original idea for a new biotechnology product, and simulate a situation in which the product shall be pitched to a prospective client. Create an informational packet to share during the presentation that includes the following items: definition and protection of intellectual property, type of patent, copyright issues and rules, trademarks, and breeders' rights for plants or animals.

5) Develop an argumentative essay surrounding public perceptions and attitudes toward the use of biotechnology in society. Develop claims and counterclaims thoroughly based on facts from research, pointing out the strengths and weaknesses of each claim. Document information using appropriate industry terminology, including areas such as federal and international

regulation and oversight, safety assessment, labeling of products, and impact on the economy.

Scientific Foundations

6) Review the structural organization of all living things at the cellular level. Summarize in an oral, written, or digital presentation how cellular organization influences scientific approaches in BioSTEM fields, with specific attention given to the various levels of eukaryotic organisms, cellular molecules, cell growth and reproduction, proteins, and nucleic acids.

7) Synthesize information from professional journals and/or websites, textbooks, and news articles to compare and contrast the structure and properties of the four macromolecules (carbohydrates, lipids, proteins, and nucleic acids). Describe in an informational artifact how the cell membrane structures may be manipulated to allow the passage of these macromolecules in a cell; relate how this knowledge is used by scientists and applied to BioSTEM research.

Problem-Resolution Skills

8) Research the terms engineering design and scientific inquiry. Compare and contrast the steps of the engineering design process to the steps of the scientific inquiry in a graphic illustration or presentation.

9) Evaluate a question to determine if it is testable and can produce empirical data. Plan an investigation that outlines the steps of the design process to collect, record, analyze, and evaluate data. For example:
    a. Given a set of symptoms, determine whether there is enough data to diagnose a medical condition as would a physician or nurse practitioner. (Science)
    b. Determine what information an actuary would need to know in order to answer a research question about which factors (diet, air quality, soil contaminates, sedentary lifestyle etc.) are contributing the most to medical insurance claims in a region. (Mathematics)

10) Given a real-world problem, identify several possible solutions using both the engineering design process and the scientific inquiry. For example:
    a. Research several treatment plans for a severe allergy sufferer as would a biochemist or biophysicist. (Science)
    b. Explore commonly used methods to decrease carbon emissions in the environment. (Technology/Mathematics)

11) Analyze solutions to a real-world problem collaboratively, to identify critical factors of the steps of the design process. Explain why these factors are critical. For example:
    a. Research types of prosthetics and submit a proposal for which one most effectively uses the design process in terms of feasibility, cost, safety, aesthetics, and durability like a biomedical engineer. (Science)
    b. Research ways a chemical engineer performs tests and monitors performance of processes throughout the stages of production for manufacturing chemicals and

products such as gasoline, synthetic rubber, plastics, detergents, cement, paper, and pulp. Submit a proposal for which one most effectively uses the design process in terms of factors like mixing, crushing, heat transfer, distillation, and drying. (Technology/Engineering)

Safety

12) Review guidelines from governmental agencies such as the Office of Safety and Health Administration (OSHA) guidelines for medical and research laboratories, OSHA guidelines for Standard Precautions and personal protective equipment, Safety Data Sheets (MSDS) and storage of reagents and compounds, and Environmental Protection Agency (EPA) laboratory guidelines. Compare and contrast the rules and regulations of each agency to develop clear expectations regarding the maintenance of safety in these laboratories.

13) Develop a safety manual for a BioSTEM laboratory, specifically for a lab that is involved with processing or developing biomedical products. Include the following in the manual: safety guidelines, procedures for accident prevention and response, and steps for reporting and documenting hazards. Explain the industry standards to maintain aseptic and sterile procedures and luminary flow, as well as the purpose of biosafety cabinets. Draw on the standard operating procedures from agencies such as OSHA, EPA, and Centers for Disease Control and Prevention (CDC) when developing the manual.

14) Identify and explain the intended use of safety equipment available in the classroom. For example, demonstrate how to properly inspect, use, and maintain safe operating procedures with tools and equipment. Also demonstrate the use of safety glasses, gloves, fire extinguisher, shower and eyewash stations.

Laboratory Foundations

15) Understand principles of, and successfully perform skills related to the BioSTEM laboratory. Utilize appropriate tools and technology and document findings using domain specific terminology. Incorporate rubrics from textbooks, CTSO guidelines, or clinical standards of practice for the following:
    a. Correct use of a centrifuge
    b. Accurate usage of balance or digital scales
    c. Safe use of an autoclave
    d. Accurate use of pH meter or strips
    e. Accurate use of an inoculating loop for agar plate streaking
    f. Accurate use and reading of glass or mercury thermometers

16) Review the use of volume measuring devices commonly used by biotechnologists, such as pipettes, micropipettes, and glassware. Prepare solutions and appropriate media, then perform serial dilutions incorporating aseptic techniques.

17) Explain in depth the terms and phrases often heard in a BioSTEM laboratory and relate how these terms and practices are important in the safe development of BioSTEM products and services.

a. Quality assurance
b. Quality control
c. Method validation
d. Appropriate documentation
e. Good manufacturing practices
f. Good laboratory practices.

18) Demonstrate the methods used in basic recordkeeping. Compare and contrast general methods and explain their design and functionalities including:
    a. Laboratory notebooks
    b. Equipment logs
    c. Disposal records
    d. Quality assurance/control records

19) In teams, apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias. Compare experimental evidence and conclusions with those drawn by others about the same testable question then communicate and defend scientific findings.

Standards Alignment Notes

**References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

BioSTEM II

Primary Career Cluster:	Science, Technology, Engineering, and Mathematics (STEM)
Program Manager:	Deborah Knoll, (615) 532-2844, Deborah.Knoll@tn.gov
Course Code:	
Prerequisite(s):	BioSTEM I
Credit:	1
Grade Level:	10
Graduation Requirement:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other BioSTEM courses.
Programs of Study and Sequence:	This is the second course in the *BioSTEM* program of study.
Aligned Student Organization(s):	SkillsUSA: http://www.tnskillsusa.com Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov Technology Student Association (TSA): http://www.tntsa.org Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visithttps://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	Dual Credit will be available for BioSTEM I, II, III and IV through Vol State Community College.
Teacher Endorsement(s):	013, 014, 015, 016, 017, 018, 047, 070, 078, 081, 125, 126, 127, 128, 129,157, 210, 211, 212, 213, 214, 230, 232, 233, 413, 414, 415, 416, 417, 418, 449, 470, 477, 519, 531, 595, 596, 700, 740, 760
Required Teacher Certifications/Training:	Teachers who have never taught this course shall attend training provided by the Department of Education.
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-stem.html

Course Description

BioSTEM II is a project-based learning experience for students who wish to further explore the dynamic range of BioSTEM fields introduced in BioSTEM I. Building on the content and critical thinking frameworks of BioSTEM I, this course asks students to apply the scientific inquiry and engineering design processes to a course-long project selected by the instructor with the help of student input. Instructors design a project in one of the BioSTEM fields of medical laboratory science, research science, food science, forensic science or environmental science that reflects the interest of the class as a whole. Students apply the steps of the scientific inquiry process throughout the course to ask questions, test hypotheses, model solutions, and communicate results. In some cases, instructors may be able to design hybrid projects that employ elements of several of the BioSTEM fields. Upon completion of this course, proficient students will have a thorough understanding of how scientists research problems, methodically apply BioSTEM knowledge and skills, and be able to present and defend a scientific explanation to comprehensive BioSTEM scenarios.

Note: Standards in this course are presented sequentially according to the traditional steps followed in the scientific inquiry process. While instructors may tailor the order of course standards to their specifications, it is highly recommended that they maintain fidelity to the overall process.

Program of Study Application

This is the second course in the Bio*STEM* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the STEM website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-stem.html.

Course Standards

Safety

1) Accurately read and interpret safety rules, including but not limited to rules published by the National Science Teachers Association (NSTA), rules pertaining to electrical safety, Occupational Safety and Health Administration (OSHA) guidelines, and state and national code requirements. Be able to distinguish between the rules and explain why certain rules apply.

2) Identify and explain the intended use of safety equipment available in the classroom. For example, demonstrate how to properly inspect, use, and maintain safe operating procedures with tools and equipment. Incorporate safety procedures and complete safety test with 100 percent accuracy.

The Roles of Scientists

3) Determine the scientist's role in explaining why phenomena occur in the natural world justified by historical and current science knowledge. Research a known scientist and present his/her contributions to scientific knowledge in the fields of food, environmental, biomedical,

research, or forensic science in an informative paper, oral presentation, or other format. Include an outline of how the scientific inquiry process was used in his/her work.

DNA Basics

4) Explain how DNA serves as a template for self-replication and encoding of biological information using an original visual DNA model. Define the terms DNA replication, DNA transcription, and translation of mRNA. Recount the processes involved in each and describe the negative outcomes if there is an interference in the process. Using domain-specific terminology, develop a scientific explanation to support the claim that the structures and mechanisms of DNA and RNA are the primary sources of heritable information.

5) Construct a visual artifact, annotated with written explanations, detailing how DNA in chromosomes is transmitted to the next generation via mitosis or meiosis. Note qualitative and quantitative traits, mutations, transposable genetic elements, and regulation of gene expressions.

6) Research and explain Mendel's model of inheritance. Using this model, trace the pattern of appearance within a family for a heritable disease that is on the recessive allele and one that is on the dominant allele. Develop an argumentative essay regarding how a certain biotechnology could genetically modify a gene to prevent this disorder, citing information from textbooks, professional journals, or websites.

7) In an argumentative essay, state claims and counterclaims about how DNA structure and function may be exploited using modern genetic engineering methods to produce specific genetic constructs, such as selecting, excising, ligating, and cloning of genetic material. Ensure the documentation is written in domain-specific medical terminology.

8) Distinguish between a number of strategies used to isolate or clone a gene, such as activation tagging, map-based gene cloning, plasmid cloning vectors, viral vectors, and shuttle vectors. Present an overview of these strategies in a visual format.

Questioning and Defining Problems

9) Engage in scientific inquiry by brainstorming to create questions to understand how a certain phenomenon in the natural world works, to understand why a phenomenon occurs, or to determine the validity of a theory.

10) Research various sources (e.g., articles, end-uses, textbooks) and identify one or more questions that will guide a scientific investigation of the various functions of DNA in food, environmental, biomedical, research, or forensic science. For example, questions should be relevant, testable, and based on current scientific knowledge.

11) Develop an original proposal as would a food, environmental, biomedical, research, or forensic scientist that will guide the scientific inquiry and follow responsible ethical practices. For example, the proposal should outline the reason for the research interest, hypothesis, methodology, data analysis, importance of study, and deliverables.

Planning and Investigating

12) Make a hypothesis that explains a scientific question about DNA and its relationship to food, environmental, biomedical, research, or forensic science. Plan and conduct a simple investigation and record observations (e.g., data) in a manner easily retrievable by others.

13) Identify the independent variables and dependent variables in an investigation. Demonstrate the effects of a changing independent variable on a dependent variable, and observe and record results.

Data Analysis and Interpretation

14) Use mathematics to represent and solve scientific questions. For example, simple limit cases can be used to determine if a model is realistic.

15) Evaluate data and identify any limitations of data analysis. Using this information, determine whether to make scientific claims from data or revise an investigation and collect more data.

16) Compare and contrast the data results from multiple iterations of a scientific investigation. For example, consider how well each explanation is supported by evidence, prior research, and scientific knowledge.

Problem Solutions and Scientific Explanations

17) Develop an explanation to a scientific question that is logically consistent, peer reviewed, and justified by DNA analysis and scientific knowledge.

Communicating Solutions and Explanations

18) Develop a technical report to communicate and defend a scientific explanation and justify its merit and validity with scientific information. Consider the ethical implications of the findings. The report can include tables, diagrams, graphs, procedures, and methodology. For example, conduct a BioSTEM forum, present scientific research, and provide evidence to support arguments for or against scientific solutions.

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning

- Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

BioSTEM III

Primary Career Cluster:	Science, Technology, Engineering, and Mathematics (STEM)
Program Manager:	Deborah Knoll, (615) 532-2844, Deborah.Knoll@tn.gov
Course Code:	
Prerequisite(s):	BioSTEM II
Credit:	1
Grade Level:	11
Graduation Requirement:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other STEM courses.
Programs of Study and Sequence:	This is the third course in the *BioSTEM* program of study.
Aligned Student Organization(s):	SkillsUSA: http://www.tnskillsusa.com Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov Technology Student Association (TSA): http://www.tntsa.org Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	Dual Credit will be available for BioSTEM I, II, III and IV through Vol State Community College.
Teacher Endorsement(s):	013, 014, 015, 016, 017, 018, 047, 070, 078, 081, 125, 126, 127, 128, 129,157, 210, 211, 212, 213, 214, 230, 232, 233, 413, 414, 415, 416, 417, 418, 449, 470, 477, 519, 531, 595, 596, 700, 740, 760
Required Teacher Certifications/Training:	Teachers who have never taught this course shall attend the training provided by the Department of Education.
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-stem.html

Course Description

BioSTEM III is an applied course in the STEM career cluster which allows students to work in groups to solve a problem or answer a scientific question drawn from real-world scenarios within their schools or communities. This course builds on *BioSTEM I* and *BioSTEM II* by applying scientific knowledge and skills to a team project. Upon completion of this course, proficient students will be able to effectively use skills such as project management, team communication, leadership, and decision making. They will also be able to effectively transfer the teamwork skills from the classroom to a work setting.

Note: Mastery of the following standards should be attained while completing a STEM project that follows the scientific inquiry process. This course prepares students for the BioSTEM IV Practicum course.

Program of Study Application

This is the third course in the *BioSTEM* program of study. For more information on the benefits and requirements of implementing this program in full, visit the STEM website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-stem.html.

Course Standards

Safety

1) Accurately read and interpret safety rules, including but not limited to rules published by the National Science Teachers Association (NSTA), rules pertaining to electrical safety, Occupational Safety and Health Administration (OSHA) guidelines, and state and national code requirements. Be able to distinguish between the rules and explain why certain rules apply.

2) Identify and explain the intended use of safety equipment available in the classroom. For example, demonstrate how to properly inspect, use, and maintain safe operating procedures with tools and equipment. Incorporate safety procedures and complete safety test with 100 percent accuracy.

Essential Components of BioSTEM Research

3) Explore how research teams are formed in order to answer scientific questions or design solutions to BioSTEM problems. Investigate a well-known team of scientists (for example, the most recent Nobel Prize-winning teams in the sciences) using a scholarly database such as the Education Resources Information Center (ERIC) or searching on the websites of universities and other research institutions and report to the class on how they collaborated to produce new scientific knowledge.

4) Research the ethical requirements for conducting DNA or biomedical research that will involve the public. For example, investigate the process for obtaining Institutional Review Board (IRB) approval when proposing a biomedical or human behavioral research study. Describe the concept of risk-benefit analysis in the production of new scientific knowledge; detail the rights

and responsibilities of researchers—and, if applicable, their subjects—as they relate to conducting research in BioSTEM fields.

5) Examine how BioSTEM professionals obtain funding, seek sponsorship, and/or gain approval to conduct their research. Explore websites such as the National Science Foundation or the National Institutes of Health to identify common processes around submitting proposals for research studies and procuring the necessary funds. Explain specific terminology such as request for proposals (RFP), competitive grants versus formula grants, and seed funding.

Research & Project Definition

6) Survey and observe people in your school and/or community. Analyze the results to determine potential BioSTEM problems that need investigating or solving. Use these ideas to conduct research to determine and define a team project. Using supporting evidence from the research, write and present a BioSTEM project proposal defining the project's purpose and goals. Include an outline of how the team intends to follow the scientific inquiry process.

Team Development

7) Define the team norms, or the set of team values, that are understood and approved by all team members. The norms should include the team's mission and guidelines for how team members will treat each other. Create a team handbook and include the documented team norms.

8) As a team, determine the professional attributes that shall be embodied by team members in order to successfully complete the proposed project. Collaboratively develop a professionalism rubric with performance indicators for each attribute agreed upon. Include the rubric in the team handbook. Attributes may include the following:
    a. Effective communication
    b. Respect for fellow team members
    c. Ethical use of intellectual property and other project resources (including ethical treatment of test subjects, if applicable)
    d. Timely achievement of project deadlines and goals
    e. Collaborative and equitable distribution of work among all team members

9) Identify the strengths and weaknesses of team members and organize the results into a graphic representation. Use the graphic representation to define the roles of each team member and create an organizational chart for the team handbook. For example, the strengths and weaknesses document will help identify the leader of the project team.

10) Research Tuckman's stage model for team development (i.e., forming, storming, norming, performing, and adjourning). Prior to starting the BioSTEM project, understand and explain each stage. After completing the project, write a brief evaluation of the team's growth at each stage.

Communication

11) Develop a process for official team communication. Define and document format guidelines for various modes of communication such as written, verbal, and email. For example, distinguish between communications appropriate to use with a team member versus communication appropriate to use with a supervisor (teacher). Document the communication guidelines in the team handbook.

12) Practice effective verbal, nonverbal, written, and electronic communication skills for working with team members while demonstrating the ability to: listen attentively, speak courteously and respectfully, discuss each member's ideas, resolve conflict, and reach a consensus for team progress.

13) Research various decision-making methods for teams, such as consensus, majority, minority, averaging, and expert. Practice using these various methods when team disagreements arise, determine which are most effective for the project team, and explain the reasoning.

Project Management

14) Perform an Internet search, interview local professionals, or consult industry journals to identify common principles of successful project management. Based on templates retrieved online or approved by the instructor, estimate a detailed project plan for the course-long project. The project plan should include at minimum the following: a schedule or Gantt chart outlining deliverables, complete with job assignments based on team member strengths and weaknesses; a tracker for progress toward goals; a time management component to log hours worked for each team member; and supporting diagrams, datasheets, and flowcharts illustrating essential stages in the process.

15) Based on the project proposal and project plan, identify projected costs and estimate a hypothetical budget. The projected costs may include but are not limited to materials, labor, equipment, and travel. Create a method to track the actual costs. For example, spreadsheets can be used to analyze and track project expenses.

Project Completion and Presentation

16) Apply all steps of the scientific inquiry process to successfully generate a hypothesis or prototype, collect the relevant data, perform the necessary tests, interpret the results, make modifications to models or prototypes, and communicate results over the course of the project's duration. Produce a technical report documenting the findings of the project and justifying the team's final conclusions based on evidence obtained.

17) As a team, design a presentation to communicate the results of the project to both a technical and a non-technical audience. The presentation should be delivered orally but supported by relevant graphic illustrations, such as diagrams and models of project findings, and/or physical artifacts that represent the outcome of the project. Prepare the presentation in a format that could be submitted to a competition such as a local Maker Faire or CTSO competitive event.

Evaluation of Project Outcome

18) Using tools that were developed during the course (i.e., professionalism rubric, project plan, organizational chart, team development evaluation), write a reflection paper to evaluate the project team's performance. Present the BioSTEM project and team evaluation to the class. The paper should address, but is not limited to the following:
    a. Did the team accomplish the project goal?
    b. How well did the team (collectively and individually) meet the performance indicators?
    c. How did the team develop throughout the duration of the project?
    d. How well did the team resolve disagreements?
    e. Was the team leadership effective?
    f. Was the project completed within budget?

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

BioSTEM Practicum

Primary Career Cluster:	Science, Technology, Engineering, and Mathematics (STEM)
Consultant:	Deborah Knoll, (615) 532-2844, Deborah.Knoll@tn.gov
Course Code:	
Prerequisite(s):	BioSTEM III
Credit:	1
Grade Level:	11, 12
Graduation Requirement:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other STEM courses.
Programs of Study and Sequence:	This is the fourth course in the *BioSTEM* program of study.
Aligned Student Organization(s):	SkillsUSA: http://www.tnskillsusa.com Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov Technology Student Association (TSA): http://www.tntsa.org Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://tn.gov/education/topic/work-based-learning.
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	Dual Credit will be available for BioSTEM I, II, III and IV through Vol State Community College.
Teacher Endorsement(s):	013, 014, 015, 016, 017, 018, 047, 070, 078, 081, 125, 126, 127, 128, 129,157, 210, 211, 212, 213, 214, 230, 232, 233, 413, 414, 415, 416, 417, 418, 449, 470, 477, 519, 531, 595, 596, 700, 740, 760
Required Teacher Certifications/Training:	Teachers who have never taught this course shall attend training provided by the Department of Education.
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-stem.html

Course Description

BioSTEM Practicum is the fourth course in the STEM cluster for students interested in learning more about careers in science, technology, engineering and mathematics with emphasis in Biotechnology. This course provides opportunity for students to use skills and content learned during the first three

courses in a real-world university or industry lab setting. Upon completion of this course, proficient students are able to identify, explain, and execute lab-based research utilizing the scientific inquiry processes. They will conduct research to develop meaningful questions, define simple problem scenarios and scientific investigations, develop fundamental design solutions, conduct basic mathematical modeling and data analysis, and effectively communicate solutions and scientific explanations to others. Students also will gain knowledge in how a biotechnology business works.

Note: For clarity, some standards include example applications to science, technology, engineering, and mathematics. Teachers are encouraged to align instruction to one or more of these areas, depending on area of expertise and student interest.

Program of Study Application

This is the fourth course in the BioSTEM program of study. For more information on the benefits and requirements of implementing this program in full, please visit the STEM website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-stem.html.

Course Standards

1) A student shall have a Personalized Learning Plan that identifies the student's long-term goals, demonstrates how the Work-Based Learning (WBL) experience aligns with the elective focus and/or high school plan of study, addresses how the student plans to meet and demonstrate the course standards, and addresses employability skill attainment in the following areas:
    a. Application of academic and technical knowledge and skills (embedded in course standards)
    b. Career knowledge and navigation skills
    c. 21st Century learning and innovation skills
    d. Personal and social skills

BioSTEM Career Planning

2) Research a company or organization that utilizes BioSTEM applications or specializes in BioSTEM solutions. Companies could range from large biotech developers, to niche organizations that retain specialists on staff to serve their particular clients' needs. For the chosen company, cite specific textual evidence from the company's literature, as well as press coverage, if available, to summarize:
    a. The mission and history of the organization
    b. Headquarters and organizational structure
    c. Products or services provided
    d. Credentials required for employment and how they are obtained and maintained
    e. Policies and procedures
    f. Reports, newsletters, and other documents published by the organization
    g. Website and contact information

3) Analyze the requirements and qualifications for various BioSTEM job postings identified from specific company websites or online metasearch engines. Gather information from multiple sources, such as sample resumes, interviews with professionals, and job boards, to determine effective strategies for realizing career goals. Create a personal resume modeled after elements based on the findings above, then complete an authentic job application as part of a career search or work-based learning experience.

4) Search for BioSTEM resumes retrieved from the websites of institutions, organizations, or professional networks. Discuss what is typically included in the resumes of BioSTEM professionals, compare and contrast several examples, and create a personal resume modeled after elements identified in the search.

5) Conduct a job search and simulate the experience by researching local employment options. In preparation for a future career in BioSTEM, complete an authentic job application form and compose a cover letter following guidelines specified in the vacancy announcement.

6) Participate in a mock interview. Prior to the interview, prepare an artifact that includes the following: tips on dress and grooming, most commonly asked interview questions, appropriate conduct during an interview, and recommended follow-up procedures. Upon completion of the interview, write a thank you letter to the interviewer in a written or email format.

Professional Ethics and Legal Responsibilities

7) Investigate current issues surrounding BioSTEM and its applications. Explore a range of arguments concerning privacy rights as they relate to the mining of personal data. Determine when it is ethical and legal to collect data for profit versus for not-for-profit purposes. Advance an original argument that debates the pros and cons and summarizes the potential ramifications for clients, the public, and one's own personal reputation, drawing on evidence gathered from news media, company policies, and state and federal laws.

8) Research a case study involving an ethical issue related to intellectual property rights. Examine a variety of perspectives surrounding the issue and develop an original analysis explaining the impact of the issue on those involved, using persuasive language and citing evidence from the research. Potential issues include copyright infringement, piracy, plagiarism, creative commons, and the state/federal laws that govern them.

Safety

9) Accurately read and interpret safety rules, including but not limited to rules published by the National Science Teachers Association (NSTA), rules pertaining to electrical safety, Occupational Safety and Health Administration (OSHA) guidelines, and state and national code requirements. Be able to distinguish between the rules and explain why certain rules apply.

10) Identify and explain the intended use of safety equipment available in the classroom. For example, demonstrate how to properly inspect, use, and maintain safe operating procedures with

tools and equipment. Incorporate safety procedures and complete safety test with 100 percent accuracy.

Transferring Course Concepts to Practicum

11) Apply skills and knowledge from previous courses in an authentic work-based learning internship, job shadow, or classroom-based project. Where appropriate, develop, practice, and demonstrate skills outlined in previous courses.

12) Define a discreet question and execute a research project to answer that question. Document all lab work in a lab notebook. Communicate results of project by a written paper or poster.

13) Continually update a lab notebook to document skills learned during the practicum and draw connections between the experience and previous course content.

14) Create and continually update a personal journal to document skills learned during the practicum and draw connections between the experience and previous course content by reflecting on:
    a. Tasks accomplished and activities implemented
    b. Positive and negative aspects of the experience
    c. How challenges were addressed
    d. Team participation in a learning environment
    e. Comparisons and contrasts between classroom and work environments
    f. Interactions with colleagues and supervisors
    g. Personal career development
    h. Personal satisfaction

Capstone Project

15) Using the scientific method, design a BioSTEM research project or experiment to investigate BioSTEM applications in healthcare, the food industry, the environment, agriculture, forensics, or related fields. Upon completion of the project, develop a technology-enhanced presentation showcasing highlights, challenges, and lessons learned from the experience. The presentation should be delivered orally, but supported by relevant graphic illustrations, such as diagrams, drawings, and models of project findings, and/or physical artifacts that represent the outcome of the project (i.e., a prototype or 3-D model). Prepare the presentation in a format that could be presented to both a technical and a non-technical audience, as well as for a career and technical student organization (CTSO) competitive event.
    a. Research to determine the task or topic
    b. Exploration of the task or topic
    c. Literature review
    d. Collection and evaluation of sources
    e. Thesis/hypothesis proposal and annotated bibliography
    f. Revision and final draft of thesis/hypothesis
    g. Outline/plan of action for paper or experiment
    h. Data collection/development of research ideas and narratives
    i. Submission of first draft of paper/lab report
    j. Feedback, revision, and submission of final draft

k. Reflection and evaluation

16) Create a portfolio, or similar collection of work, that illustrates mastery of skills and knowledge outlined in the previous courses and applied in the practicum. The portfolio should reflect thoughtful assessment and evaluation of the progression of work involving the application of steps of the scientific method (depending on the nature of the work-based learning project). The following documents will reside in the career portfolio:
    a. Career and professional development plan
    b. Resume
    c. List of responsibilities undertaken through the course
    d. Examples of visual materials developed and used during the course (such as graphics, drawings, models, presentation slides, videos, and demonstrations)
    e. Description of technology used, with examples if appropriate
    f. Periodic journal entries reflecting on tasks and activities
    g. Feedback from instructor and/or supervisor based on observations

Standards Alignment Notes

*References to other standards include:

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - **Note**: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.