Department of Education | College, Career and Technical Education

Advanced Food Science

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	C18H24
Prerequisite(s):	*Food Science and Safety* (C18H26)
Credit:	1
Grade Level:	12
Elective Focus - 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.
Concentrator	This course satisfies one out of two required courses that must be taken from a single program of study to meet the Perkins V concentrator definition requirements.
Programs of Study and Sequence:	This is the fourth and final course in the *Food Science* program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Vacant , Executive FFA Secretary, Stena Meadows, East Tennessee FFA Consultant, (423) 414-8669, Stena.Meadows@tn.gov Brad Pardon, Middle Tennessee FFA Consultant, (615) 253-5207, Brad.Pardon@tn.gov Emily Grant, West Tennessee FFA Consultant, (731) 431-1183, Emily.Grant@tn.gov
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 http://tn.gov/education/cte/work_based_learning.shtml.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	None
Teacher Resources:	https://tn.gov/education/article/cte-cluster-agriculture-food-natural-resources

Course Description

Advanced Food Science is an applied course designed to prepare students for further education and careers in food science and technology. This course covers advanced principles of food science, characteristics and properties of food products, processing and grading techniques and skills, and

food labeling and packaging principles. Upon completion of this course, proficient students will be able to pursue advanced training in food science at a postsecondary institution.

Program of Study Application

This is the fourth and final course in the *Food 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://tn.gov/education/article/cte-cluster-agriculture-food-natural-resources.

Course Standards

Introduction to Food Processing

1) Use local news media, organizational websites, and real-time labor market information to investigate occupations in food science. Compare and contrast the knowledge, skills, and abilities necessary for employment, as well as the typical level of education required.

2) Summarize how principles of food science are applied for the conversion of agricultural commodities into consumer products. Determine how food safety techniques applied in the home, at retail establishments, and in industrial food processing environments benefit human health.

3) Review common laboratory safety procedures for tool and equipment operation in the food 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.

4) 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.

Processing and Evaluation of Red Meat

5) Identify major species and breeds of livestock utilized for red meat production. Describe the fabrication, processing, packaging, and quality analysis of red meats and their by-products.

6) Explain carcass preparation and fabrication procedures and identify associated equipment, safety, sanitation, and quality control procedures. Demonstrate in a live setting or in a presentation format the ability to identify wholesale and retail cuts of meat and meat by-products, and correlate them to major muscle groups.

7) Analyze the United States Department of Agriculture (USDA) inspection and grading procedures and compose an argumentative essay justifying their purpose in the food industry, developing claim(s) and counterclaim(s) with specific evidence from case studies found in news media. Describe the principles of quality and yield grading. Demonstrate in a live setting or in a presentation format the ability to perform the evaluation and grading of carcasses,

wholesale cuts, and retail cuts to determine maturity, final quality grade, and final yield grade, and provide written and oral justification for evaluation conclusions.

8) Demonstrate in a live setting or in a presentation the ability to perform methods of further processing fabrication for processed and value added products including comminuted meat products, emulsions, and cured meats. Using quantitative reasoning and appropriate units, calculate proper meat product formulations based upon required protein levels and USDA allowances for various products.

Processing and Evaluation of Milk and Dairy Products

9) Identify major breeds of livestock utilized for dairy production. Describe the products, by-products, processing, packaging, and quality analysis associated with each breed.

10) Summarize milk quality test and testing procedures in an explanatory narrative. Demonstrate in a live setting or in a presentation the ability to perform quality evaluations of milk and dairy products, providing written and oral justification for evaluation conclusions.

11) Describe milk preparation and processing procedures, addressing procedures specific to equipment, safety, sanitation, and quality control. Analyze the composition of milk and examine concepts and principles that verify the scientific foundation for the pasteurization process.

12) Identify varieties and characteristics of cultured and frozen milk products. Demonstrate in a live setting or presentation the ability to follow procedures used to process buttermilk, yogurt, and ice cream, attending to appropriate ratios and units.

13) Identify varieties, characteristics, and classifications of cheeses. Demonstrate in a live setting or presentation format the ability to follow procedures used to process, classify, and grade cheese, attending to appropriate ratios and units.

Processing and Evaluation of Poultry, Eggs, and Fish

14) Identify major poultry breeds and fish species utilized for meat and egg production. Describe the fabrication, processing, packaging, and quality analysis of poultry meat, eggs, and fish.

15) Compare and contrast the carcass preparation and fabrication procedures in poultry and fish, addressing procedures specific to equipment, safety, sanitation, and quality control. Demonstrate in a live setting or in a presentation the ability to identify retail cuts of poultry, fish, and related by-products.

16) Outline the United States Department of Agriculture (USDA) inspection procedures and system for classes, standards, and grades of poultry products and fish. Demonstrate in a live setting or in a presentation the ability to perform the evaluation and grading of carcasses and parts of chickens and turkeys, pre-cooked, further processed, and poultry meat products, providing written and oral justification for evaluation and grading scores. Evaluate and grade

eggs for interior and exterior quality and provide written and oral justification for evaluation conclusions.

Processing and Evaluation of Vegetables, Fruits, and Nuts

17) Explain the processing, packaging, and quality analysis of vegetables, fruits, nuts and their by-products.

18) Describe preparation and processing procedures for vegetables, fruits, nuts, and their by-products, addressing procedures specific to equipment, safety, sanitation, and quality control. Research and cite texts explaining the use of various monitoring systems to appraise food quality, such as the Brix scale.

Food Product Packaging and Labeling

19) Identify laws regulating the packaging and labeling of food products, and summarize industry requirements in an explanatory text. Demonstrate in a live setting or in a presentation the ability to perform packaging and labeling procedures for different food products.

20) Research storage and transportation issues pertaining to packaged food products and the extent to which noted evidence and reasoning justifies implications for safety and quality, citing specific examples from news media and academic journals.

Food Product Marketing

21) Write an informative essay illustrating the application of fundamental economic principles such as supply, demand, and profit to the food science industry. Describe marketing considerations and methods of merchandising food products. Discuss how quality and yield grade factors affect product marketing. Revise, edit, and rewrite essay with peer feedback.

22) Compare and contrast various blockchain technologies used in the food science industry. Articulate how these technologies are changing, and how foods are produced and marketed in the United States and globally.

Consumer Issues

23) Review data from news media and company product recall notices to explore consumer satisfaction issues. Cite specific evidence to assess the impact of organic, natural, ethnic, religious-based, and other specialized processing methods in the food industry. Compare and contrast the advantages and disadvantages of value added and specialty products and conduct research to evaluate and summarize consumer interest and trends related to these products.

24) Investigate the food product development process. Evaluate the use of food batch procedures for the purpose of economic efficiency. Describe the application of sensory evaluation

methods to test food product flavor, appearance, and texture by quantitative description and simple difference testing.

25) Identify consumer concerns related to food quality and safety (such as antibiotic use, genetically modified organisms (GMOs), pesticide use, and food borne illnesses), and discuss the economic implications when low-quality and unsafe foods enter the market.

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, CS, and FPP 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.