



## CTSO Course Alignments: Agricultural and Biosystem Engineering

Below you will find standards for the Agricultural and Biosystem Engineering course aligned with competitive events from appropriate career and technical student organizations (CTSOs). Knowing the aligned events for your organization will allow you to have additional tools for teaching course standards, as well as increase student engagement and preparation in your CTSO activities. The final column recommends potential tools from other CTSO organizations. Even if your students are not participating in these organizations, available rubrics, tools, and materials can also add to the instructional resources at your disposal for best teaching your content.

**Important to note:** While the aligned activities below can be important tools in teaching course standards, it is important to note that events may not cover a standard in its entirety and should not be the sole instructional strategy used to address a standard.

	STANDARD	ALIGNED FFA COMPETITIVE EVENTS/PROGRAMS	OTHER POTENTIAL CTSO TOOLS & RESOURCES
1	Identify the benefits of knowing and applying basic safety procedures in both an agricultural laboratory and workplace. Interpret current Occupational Safety and Health Administration (OSHA) guidelines to conduct a compliance review of the agricultural laboratory, including a written summary justifying the findings with recommendations for improving the safety of working conditions. (TN Reading 1, 2; TN Writing 1, 4, 7, 9; AFNR CS.06, CS.07)		<ul style="list-style-type: none"> <li>• <b>HOSA:</b> Biomedical Laboratory Science</li> <li>• <b>SkillsUSA:</b> Occupational Health and Safety</li> <li>• <b>TSA:</b> Biotechnology Design</li> </ul>
2	Review common laboratory safety procedures for tool and equipment operation in the agricultural and biosystems engineering 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. (TN Reading 3; ARNR CS)		<ul style="list-style-type: none"> <li>• <b>HOSA:</b> Biomedical Laboratory Science</li> <li>• <b>SkillsUSA:</b> Occupational Health and Safety</li> <li>• <b>TSA:</b> Biotechnology Design</li> </ul>
3	Gather and analyze information from multiple authoritative sources such as the United States Bureau of Labor Statistics to develop a written projection of the occupational trends related to agricultural engineering. Supplement the narrative with relevant and properly cited charts, graphs, and other visual representations. (TN Reading 1, 9; TN Writing 2, 7, 9)		<ul style="list-style-type: none"> <li>• <b>FCCLA:</b> Job Interview; Career Investigation; Entrepreneurship</li> <li>• <b>HOSA:</b> Researched Persuasive Speaking</li> <li>• <b>SkillsUSA:</b> Job Interview; Entrepreneurship; Employment Application Process</li> </ul>

4	Design a project plan for an agricultural engineering project, outlining a strategy for working within a given set of parameters, constraints, and resources. Include in the plan components related to the budget, timeline, safety considerations, and strategies to minimize adverse environmental impacts. (TN Writing 4, 9)		
5	Synthesize case studies and field experience to provide evidence of the impact of geographic information systems (GIS) and global positioning systems (GPS) on agricultural demographics, precision agriculture, pasture management, water quality, watershed management, and waste pollution. Discuss the implications for industry and labor with the incorporation of these technologies into more and more facets of agricultural life. (TN Reading 1, 9; TN Writing 2, 7, 9)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Agricultural Technology and Maintenance, Environmental and Natural Resources</li> </ul>	<ul style="list-style-type: none"> <li>• <b>FCCLA:</b> Environmental Ambassador</li> <li>• <b>HOSA:</b> Researched Persuasive Speaking</li> <li>• <b>TSA:</b> Essays on Technology</li> </ul>
6	Identify various GIS and GPS applications and explain their uses in precision agriculture, including but not limited to the following: precision agriculture management zones, crop water and drought areas, crop imaging, land correlation to crop yields, yield map cleaning and management, drainage analysis and tile mapping, crop data analysis, soil darkness mapping, suitability modeling, and slope angle and accuracy. (TN Writing 2, 7, 9; TN Math N-Q)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Agricultural Technology and Maintenance, Land Evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>HOSA:</b> Medical Innovations</li> </ul>
7	Demonstrate the ability to make land use, management, development, and equipment recommendations for a specific plot of land in rural and urban settings. Provide graphical and textual evidence to support each recommendation. (TN Reading 1, 3, 7; TN Writing 2, 7, 8, 9)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Environmental and Natural Resources, Land Evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>HOSA:</b> Prepared Speaking; Extemporaneous Writing; Medical Innovations</li> </ul>
8	Analyze, map, and disseminate geographic information systems (GIS) and global positioning systems (GPS) data portraying a drainage map of a specified region. Citing specific evidence from findings, propose changes to drainage and irrigation systems and justify recommendations against accepted soil erosion control practices. (TN Reading 3, 9; TN Writing 1, 4, 6, 8, 9; TN Math N-Q, S-ID, S-IC)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Land Evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>HOSA:</b> Researched Persuasive Speaking</li> </ul>
9	Describe the relationships between concepts of hydrostatics, kinematics, and dynamics of fluid flows used for agricultural industry irrigation systems, including but not limited to pipes and open channels, using domain-specific language. (TN Reading 4, 5; TN Writing 9)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Agricultural Technology and Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• <b>HOSA:</b> Prepared Speaking; Extemporaneous Writing</li> <li>• <b>TSA:</b> Prepared Presentation; Extemporaneous Presentation</li> </ul>
10	Research agricultural buildings and facilities that meet industry benchmarks for energy efficiency and environmental sustainability. Collect observations on the costs and benefits of such structures and make recommendations to conserve energy and decrease operational cost, developing claim(s) with specific evidence from research. (TN Reading 1, 7; TN Writing 1, 7, 9)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Environmental and Natural Resources</li> </ul>	<ul style="list-style-type: none"> <li>• <b>FCCLA:</b> Environmental Ambassador</li> <li>• <b>HOSA:</b> Researched Persuasive Speaking</li> </ul>

11	Create a detailed construction plan for an agricultural facility suitable for a designated site, using natural systems and renewable energy where possible, and conserving energy and material resources in construction and maintenance while meeting building certification requirements. Include plans for recreating land or environments impacted by the construction (i.e., replacing displaced wetland with an artificial wetland). (TN Reading 3, 7; TN Writing 2, 7, 9)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Environmental and Natural Resources</li> </ul>	<ul style="list-style-type: none"> <li>• <b>FCCLA:</b> Environmental Ambassador</li> </ul>
12	Analyze the physical properties of selected agricultural crops and food products as they impact harvesting, storage, processing, and transport requirements, including but not limited to density, shape, moisture content, water potential, friction and flow of particulate solids, terminal velocity, thermal properties, and viscoelastic behavior of solids. Develop a fact sheet detailing the appropriate harvesting, storage, processing, and transportation equipment required for the range of crops and products analyzed, providing written justification for the use of chosen equipment. (TN Reading 1, 7, 8, 9; Writing 2, 8; TN Math N-Q, A-SSE, A-REI, G-C, G-GMD, G-MG)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Farm Business Management, Forestry, Environmental and Natural Resources</li> </ul>	
13	Develop a safety, storage, and disposal plan for agricultural chemicals such as pesticides, fertilizers, and veterinary medicines. Outline specific procedures pertaining to responsible selection and storage, mixing, transport, application, and disposal of waste, in compliance with applicable regulatory standards. (TN Reading 1, 3; Writing 2, 4, 8, 9)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Farm Business Management</li> </ul>	<ul style="list-style-type: none"> <li>• <b>HOSA:</b> Community Awareness; Health Education</li> <li>• <b>SkillsUSA:</b> Occupational Health and Safety</li> </ul>
14	Analyze the chemical and physical properties of selected agricultural fertilizers and chemicals in relation to specific crops and determine the most efficient and effective method of application. Demonstrate in a live setting or presentation the ability to calibrate equipment for liquid, solid, and gaseous applications. (TN Reading 3, 7, 9; Writing 2, 9)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Agriscience Fair</li> </ul>	<ul style="list-style-type: none"> <li>• <b>HOSA:</b> Prepared Speaking</li> <li>• <b>TSA:</b> Prepared Presentation, Engineering Design</li> </ul>
15	Participate in a team-driven agricultural engineering project approved by the instructor that includes research, planning, analysis, construction, testing, and evaluation phases to measure success and adherence to legal constraints. Prepare periodic oral and written reports to demonstrate progress. (TN Reading 1, 7, 9; Writing 2, 4, 8, 9)	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Agriscience Fair, Agricultural Technology and Maintenance, Forestry, Environmental and Natural Resources, Land Evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>DECA:</b> Business Research Project</li> </ul>
ALL	<b>CAN BE USED WITH ALL/MOST STANDARDS</b>	<ul style="list-style-type: none"> <li>• <b>FFA:</b> Agriscience Fair, Agricultural Technology and Maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• <b>FCCLA:</b> Illustrated Talk; Chapter in Review Display; Chapter in Review Portfolio</li> <li>• <b>SkillsUSA:</b> Career Pathways Showcase; Job Skills Demonstration A; Job Skills Demonstration O; Prepared Speech; Extemporaneous Speaking; Chapter Display</li> </ul>