Maryland CTE Programs of Study

Agriculture Science I (2025)

General requirements. This course is recommended for students in Grades 9-12, and there are no prerequisites. 1

1 **General requirements. This course is recommended for students in Grades 9-12, and there are no prerequisites.** 1

Introduction. 2

A **Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.** 2.A

B **The Agriculture Career Cluster concentrates on scientific advancement of agriscience, cultivation, processing, and distribution of agricultural products, employing advanced technologies and sustainable practices to optimize global food systems. This Cluster also supports other plant- and animal-based industries including regenerative agriculture, sustainable logging, and fisheries. This Cluster has meaningful connections with the Energy and Natural Resources Cluster, highlighting a symbiotic relationship that emphasizes stewardship and resilient communities.** 2.B

C **The Agriculture Science Career & Technical Education Program of Study begins with Agriculture Science I, a common foundations course covering plant and animal biology, soils, water, and sustainable food systems. From there, districts may offer one or both two-course pathways: Crop Science II–III, which prepares students for the BASF Plant Science certification while using drone and satellite imagery in labs that align with both the University of Maryland's PLSC 112 Introductory Crop Science and the University of Maryland Eastern Shore's PLSC 184 Introduction to Plant Science; and Animal Science II–III, which culminates in the Elanco Fundamentals of Animal Science credential and capstone projects that map to UMD's ANSC 101 Principles of Animal Science as well as UMES's ANPT 114 Introduction to Animal Science. The Animal Science pathway also lays the academic and clinical groundwork for an optional fourth- level Veterinary Medicine IV course, enabling students to pursue the Elanco Veterinary Medicine certification.** 2.C

D **In Agriculture Science I, students complete Hands-on labs include soil pH testing, basic microscopy, small-plot cultivation, and low-stress animal-handling demonstrations. FFA leadership, career exploration, and a supervised agricultural experience proposal help students decide between the Crop Science or Animal Science pathway for Course 2. Completion of Agriculture Science I establishes half**

Skip to main content

of the knowledge base required for either the BASF Plant Science or Elanco Animal Science certification. 2.D

E **Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.** 2.E

F **Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs). CTSOs are a cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland.** 2.F

Knowledge and Skills. 3

A **The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:** 3.A

1. Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work. 3.A.1
2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn. 3.A.2
3. Employ effective reading, writing, and technical documentation skills. 3.A.3
4. Solve problems using critical thinking techniques and structured troubleshooting methodologies. 3.A.4
5. Demonstrate leadership skills and collaborate effectively as a team member. 3.A.5
6. Implement safety procedures, including proper handling of equipment and following engineering guidelines. 3.A.6
7. Exhibit an understanding of legal and ethical responsibilities in the agriculture science field, following intellectual property laws and best practices for agriculture science. 3.A.7
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting. 3.A.8

B **The student identifies various career pathways in the agriculture science field. The student is expected to:** 3.B

1. Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles in engineering design. 3.B.1
2. Create a professional resume and portfolio that reflect skills, projects, certifications, and recommendations. 3.B.2
3. Demonstrate effective interview skills for roles in agriculture science. 3.B.3

C **The student develops technology and digital literacy skills. The student is expected to:** 3.C

Skip to main content

1. Apply secure file-management practices (e.g., clear naming conventions, logical folder structures, routine backups, and version control) when handling digital documents, GIS layers, sensor logs, and drone imagery. 3.C.1
2. Evaluate the credibility and reliability of online resources—such as peer-reviewed journals, extension databases, and regulatory websites—to inform agriscience decisions and validate research findings. 3.C.2
3. Demonstrate safe, ethical, and legal use of digital platforms by following data-privacy laws, honoring software licenses and fair-use guidelines, and sharing geospatial or aerial imagery responsibly. 3.C.3
4. Collaborate effectively through cloud-based tools (shared drives, real-time documents, virtual whiteboards, project-management apps) to coordinate tasks, exchange data, and communicate with peers, mentors, and industry partners. 3.C.4
5. Integrate multiple software applications (spreadsheets, GIS programs, drone-flight planners, sensor dashboards, and basic statistical packages) to analyze and visualize data that support precision agriculture, animal-enterprise management, and sustainability decisions. 3.C.5

D The student integrates core academic skills into agriculture science practices. The student is expected to: 3.D

1. Apply mathematical concepts—including ratio, proportion, algebraic equations, and introductory statistics—to balance livestock rations, calibrate field equipment, compute medication dosages, and analyze yield- or growth-rate data. 3.D.1
2. Design and conduct scientific investigations by formulating testable hypotheses, controlling variables, collecting quantitative and qualitative data, and interpreting results with spreadsheets or graphing tools. 3.D.2
3. Produce clear, well-organized technical documents (lab reports, research briefs, standard- operating procedures) that follow accepted formatting and citation styles such as APA or MLA. 3.D.3
4. Read, interpret, and synthesize complex informational texts (peer-reviewed articles, extension bulletins, regulatory guidelines, product labels) to support evidence-based decision-making in crop and animal sciences. 3.D.4
5. Present findings to diverse audiences through oral presentations, data-rich posters, and multimedia formats, employing effective visuals, precise terminology, and audience- appropriate explanations. 3.D.5

E The student demonstrates the necessary skills to apply the scientific method and maintain safe, ethical practices in crop- and animal-science laboratories. The student is expected to: 3.E

1. Formulate testable questions, hypotheses, and data-collection plans for experiments involving living plants and animals. 3.E.1
2. Select and correctly use common agriscience tools (pH meters, microscopes, grain-moisture testers, livestock scales, etc.), recording measurements with appropriate SI units. 3.E.2

Skip to main content

3 Practice laboratory, field, and animal-handling safety—including PPE, biosecurity zones, SDS use, and humane care codes—consistent with OSHA and FFA standards. 3.E.3

4 Analyze experimental data with spreadsheets or handheld devices, interpret results, and communicate findings in technical reports that follow APA style. 3.E.4

5 Demonstrate ethical decision-making when handling living organisms and agricultural resources, referencing current USDA and EPA regulations. 3.E.5

F The student demonstrates the necessary skills to explain core biological principles that underpin both crop and animal systems. The student is expected to: 3.F

1 Compare plant and animal cell structures, explaining photosynthesis, respiration, and digestion as energy-conversion processes. 3.F.1

2 Diagram the life cycles of a major crop (e.g., corn) and a livestock species (e.g., beef cattle), identifying key growth stages and husbandry requirements. 3.F.2

3 Illustrate basic Mendelian inheritance and apply Punnett squares to predict plant traits and animal coat-color outcomes. 3.F.3

4 Relate the role of DNA technology (tissue culture, genomic selection) in modern plant improvement and animal breeding. 3.F.4

5 Evaluate how environmental factors (light, temperature, water, nutrition) influence plant growth and animal performance. 3.F.5

G The student demonstrates the necessary skills to analyze plant- and soil-system interactions that drive sustainable crop production. The student is expected to: 3.G

1 Identify major agronomic crops grown in the Mid-Atlantic region and describe their anatomy, morphology, and economic importance. 3.G.1

2 Characterize Mid-Atlantic soil profiles, test soil pH & nutrient status, and recommend basic fertility and liming programs. 3.G.2

3 Describe integrated pest-management (IPM) strategies—cultural, biological, and chemical—for weeds, insects, and diseases highlighted in the BASF blueprint. 3.G.3

4 Explain watershed concepts and water-quality BMPs (buffer strips, nutrient-management plans) that meet state conservation standards. 3.G.4

5 Use precision-ag tools (hand-held GPS, remote sensing apps) to map a field, calculate plant populations, and propose variable-rate seeding or fertilization. 3.G.5

H The student demonstrates the necessary skills to analyze biological, nutritional, and welfare principles that govern responsible animal production. The student is expected to: 3.H

1 Classify livestock species and breeds common to Maryland; describe their anatomy, physiology, and primary products. 3.H.1

Skip to main content

2 Compare monogastric and ruminant digestive systems and relate feed components (water, carbohydrates, proteins, fats, minerals, vitamins) to growth and health. 3.H.2

3 Outline basic reproductive anatomy, estrous cycles, and assisted-reproduction technologies introduced in the Elanco blueprint. 3.H.3

4 Recognize clinical signs of common diseases; explain biosecurity, vaccination, and parasite- control plans for beef, dairy, swine, sheep, and poultry. 3.H.4

5 Demonstrate low-stress animal-handling techniques and discuss the Five Freedoms framework for animal welfare. 3.H.5

I The student demonstrates the necessary skills to evaluate sustainable practices, emerging technologies, and career pathways in global food systems. The student is expected to: 3.I

1 Compare carbon-footprint and resource-use data for conventional, regenerative, and precision-ag production models. 3.I.1

2 Interpret basic regulations and policies governing pesticides, antibiotics, nutrient management, and animal welfare at the state and federal levels. 3.I.2

3 Use career-exploration software to map postsecondary options—including BASF Plant Science or Elanco Animal Science certification, UMD majors (PLSC, ANSC), apprenticeships, and two- or four-year degrees—into a personal plan of study. 3.I.3

4 Participate in an FFA Career Development Event (Ag Issues, Environmental & Natural Resources, Livestock Judging, or Agronomy) and reflect on the technical and leadership skills demonstrated. 3.I.4

5 Develop a Supervised Agricultural Experience (SAE) proposal—crop or animal focused—that sets measurable goals for completion in Course 2 and supports certification evidence requirements. 3.I.5