Maryland CTE Programs of Study

Horticulture Science III (2025)

GENERAL REQUIREMENTS. This course is recommended for students in Grades 11-12, and Horticulture Science I and II are the prerequisites. 1

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INTRODUCTION 2

A **Career and Technical Education (CTE) 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 is dedicated to careers involving the study and management of plant growth, soil health, and pest management, focusing on sustainable crop production for both food and goods. This Sub-Cluster includes careers in agronomy, horticulture, timber and plant fiber harvesting, and soil science that are aimed at enhancing crop yields, preserving soil resources, and developing advanced production practices.** 2.B

C **The Horticulture Science CTE Program of Study is designed to prepare students for successful careers in agriculture, specifically within the fields of horticulture, agronomy, soil science, integrated pest management, and sustainable crop production. Aligned with the Advance CTE Agriculture Career Cluster Framework, these courses provide a progressive learning experience that equips students with the foundational knowledge, practical skills, and technical competencies needed to excel in a rapidly evolving green industry.** 2.C

D **Horticulture Science III enhances students' efficiency, productivity, and sustainability in horticultural operations through the use of technology—such as environmental sensors, data analytics, and controlled environment agriculture systems.** 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

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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. Produce a professional certification portfolio for CPH submission: SOPs, continuing-education log, ethics reflections, and project case studies. 3.A.1
2. Lead and evaluate a capstone team project—such as a themed botanical installation— managing budget, timeline, and quality control, then present lessons learned in a formal report. 3.A.2
3. Author and peer-review a journal-style article on an advanced horticulture topic; adhere to AHS formatting and reference guidelines. 3.A.3
4. Design and deliver a client pitch for a commercial floral or landscape contract, including cost estimates, design renderings, and maintenance plans. 3.A.4
5. Maintain professional standards in an internship or externship setting—attendance, communication, safety compliance—and document performance evaluations. 3.A.5

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

1. Analyze advanced career roles (e.g., greenhouse operations manager, research horticulturist, master florist, turfgrass researcher), detailing required graduate credentials, research competencies, and leadership responsibilities. 3.B.1
2. Network with professionals via virtual conferences or industry associations (MNLGA, AIFD); summarize key takeaways and how they inform personal career planning. 3.B.2
3. Research entrepreneurial opportunities—boutique floral studio, specialty nursery, design consultancy—and draft a basic business model canvas for one chosen venture. 3.B.3
4. Evaluate certification maintenance and continuing-ed requirements (CEU credits for CPH, CFD) and integrate them into a five-year professional development plan. 3.B.4

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

1. Configure and analyze data from a network of IoT sensors (moisture probes, pH/EC loggers) feeding into an online dashboard; interpret alerts to optimize irrigation and feeding. 3.C.1
2. Employ image-analysis software or drone-based NDVI mapping to assess plant health across a trial block; generate and present a georeferenced stress map. 3.C.2

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3 Develop an automated fertigation algorithm using spreadsheet macros or lightweight scripting (e.g., Python), simulating input/output relationships based on sensor data. 3.C.3

4 Design and maintain a professional social-media campaign for a horticultural project— scheduling posts, documenting engagement metrics, and reflecting on digital outreach effectiveness. 3.C.4

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

1 Conduct advanced data analysis: perform statistical tests (t-tests, ANOVA) on experimental growth trials and interpret p-values in the context of horticultural research. 3.D.1

2 Apply chemistry principles by calculating buffer solutions for nutrient injectors, adjusting pH of irrigation water, and explaining dissociation equilibria. 3.D.2

3 Use geometric and spatial reasoning to design efficient greenhouse layouts or vertical-farm racks, calculating area, volume, and light-distribution ratios. 3.D.3

4 Integrate business math by modeling cash-flow projections for a startup nursery or floral enterprise and evaluating break-even points. 3.D.4

E The student designs and troubleshoots advanced production modules—such as vertical farms, controlled-environment agriculture (CEA), or integrated aquaponics—to meet commercial and sustainability objectives. The student is expected to: 3.E

1 Engineer a vertical-farm prototype: calculate light distribution for LED arrays, model airflow for humidity control, and program PLCs for automated nutrient dosing. 3.E.1

2 Compare plant performance in aquaponic vs. hydroponic setups: measure growth rate, nutrient uptake, and fish health metrics; summarize in a comprehensive report. 3.E.2

3 Integrate renewable-energy solutions (solar panels, rainwater harvesting) into a CEA design; perform payback-period calculations and ROI projections. 3.E.3

F The student readies for MNLGA CPH certification by compiling professional documentation, authoring technical articles, and demonstrating ethical business leadership. The student is expected to: 3.F

1 Assemble a CPH submission portfolio: include detailed SOPs, continuing-education logs, project case studies, and ethics-scenario reflections. 3.F.1

2 Author a peer-reviewed style technical article on a horticultural topic of choice; follow AHS journal formatting guidelines and submit for mock review. 3.F.2

3 Facilitate quarterly team workshops on safety, quality assurance, and ethics; document agendas, attendance, and post-workshop evaluations. 3.F.3

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The student orchestrates an enterprise-level IPM program—integrating monitoring data, predictive models, and professional standards—to maintain

plant health and meet CPH regulatory requirements. The student is expected to: 3.G

1. Create a decision-tree protocol that integrates pest scouting data (trap counts, visual inspections), environmental conditions (degree-day models), and economic thresholds to trigger precise cultural or biological controls. 3.G.1
2. Configure and maintain a network of digital traps and sensor-linked cameras; upload data to a central dashboard, generate weekly trend analyses, and recommend interventions. 3.G.2
3. Author a facility-level IPM & pesticide-use compliance manual—including record-keeping templates, inspection schedules, emergency response plans, and Maryland Department of Agriculture reporting procedures. 3.G.3
4. Design and conduct replicated greenhouse trials comparing two biological control agents; collect quantitative data on pest suppression and non-target impacts, then present a cost- benefit analysis. 3.G.4
5. Track and document ≥10 hours of CPH-approved continuing-education activities (workshops, webinars, field days), summarizing key learnings and their application to your IPM program. 3.G.5

H The student leads turfgrass research projects—developing and validating best practices for elite sports turf, specialty lawns, and ornamental groundcovers. The student is expected to: 3.H

1. Plan and execute randomized complete-block trials on sports-field grasses testing irrigation regimes and mowing frequencies; use proper blocking and replication, then analyze results via ANOVA. 3.H.1
2. Operate a drone to capture NDVI imagery over trial plots; process data to identify turf stress zones and draft targeted management recommendations. 3.H.2
3. Compile a comprehensive guide for high-use turf (athletic fields, event lawns) covering aeration schedules, topdressing protocols, pest and disease monitoring, and renovation strategies. 3.H.3
4. Establish demonstration plots for two experimental turfgrass cultivars; record establishment rates, wear tolerance, and color retention over a season; present findings in a poster session. 3.H.4

I The student enhances leadership, communication, and professional skills necessary for eventual attainment of the MNLGA CPH certification, building from prior courses. The student is expected to: 3.I

1. Prepare detailed technical reports, case studies, and presentations using industry-standard terminology and best practices. 3.I.1
2. Employ advanced quantitative methods (e.g., statistical analysis, economic modeling) to evaluate production strategies and outcomes. 3.I.2
3. Demonstrate the ability to manage horticultural projects, oversee team operations, and maintain compliance with relevant laws, regulations, and industry standards. 3.I.3

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4 Engage in advanced problem-solving and critical thinking exercises, reflecting on decisions, evaluating risks, and proposing evidence-based improvements in horticultural systems. 3.I.4

5 Develop a professional portfolio showcasing horticultural competencies (e.g., documented field experiences, continuing education activities, and professional references), demonstrating readiness for the MNLGA CPH exam. 3.I.5

6 Coordinate and lead advanced floral design projects or installations (e.g., large-scale events, high-end retail displays), practicing resource management, quality control, and team supervision as aligned with MNLGA CPH leadership standards. 3.I.6

7 Develop a comprehensive business or enterprise plan—including market analysis, financial projections, and risk-management strategies—for a horticultural venture, demonstrating mastery of supervisory-level decision-making and communication skills. 3.I.7

J The student conceives and executes large-scale, client-driven floral projects—demonstrating advanced creativity, technical mastery, and professional business practices aligned with AIFD CFD criteria. The student is expected to: 3.J

1 Manage the full scope of a wedding or corporate-event floral installation—from client consultation and budget development through design, build-out, and teardown—while supervising a team of peers. 3.J.1

2 Create three marketable floral-design product lines (e.g., subscription bouquets, event collection packages); include cost analyses, production workflows, and marketing strategies. 3.J.2

3 Use the AIFD CFD evaluation rubric to assess your own portfolio designs on creativity, conceptualization, technical skill, workmanship, and marketability; document actionable improvement plans. 3.J.3

4 Plan and execute a public “portfolio review” event—inviting real or mock clients—presenting your top 10 designs, gathering feedback via structured surveys, and generating post-event reflections. 3.J.4