MARYLAND HIGH SCHOOL CAREER & TECHNOLOGY EDUCATION PROGRAMS OF STUDY

MARYLAND STATE DEPARTMENT OF EDUCATION

EQUITY AND EXCELLENCE

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CAREER AND TECHNOLOGY EDUCATION (CTE):

EDUCATING TOMORROW'S WORKFORCE TODAY

Career and Technology Education (CTE) provides high school and community college students an opportunity to pursue a sequential technical and academic program of study leading to advancement in a career field. High school CTE programs of study give students the opportunity to transition smoothly into further education or postsecondary education and to earn college credit and/or industry credentials in a career field of interest. The Maryland State Department of Education (MSDE) works closely with the Governor's Workforce Development Board to identify new programs in response to Maryland's workforce and economic development needs and to ensure all CTE programs keep pace with industry expectations to prepare students for both college and careers.

CAREER CLUSTERS: THE NEW CAREER AND TECHNOLOGY EDUCATION

MSDE, in partnership with statewide industry advisory groups, identified ten (10) Career Clusters that represent core business functions across broad industry areas in Maryland. Career Clusters allow students to explore a wide range of career options and to apply academic and technical skills in a career area. Business partners further identified career pathways based on the end-to-end business processes within Career Clusters. Career Pathways are like road maps of learning that help students plan for and pursue further education and careers. Using the Career Clusters Framework to develop new CTE program pathways at the high school-level helps students gain a better understanding of the world of work and what is required to prepare for a career. Each Career Cluster includes multiple CTE program options for students to gain more advanced understanding and preparation for a career.

MARYLAND CTE PROGRAMS OF STUDY

Maryland CTE programs of study are statewide model programs designed to prepare high school students for the 21st Century's global economy and its rapidly changing workforce needs. All CTE programs are aligned to established academic and technical skill standards to ensure student preparation for college and careers. These programs also include work-based learning opportunities (e.g., internships, clinical experiences or industry-mentored projects) tied to the student's area of interest. Upon completion of a Maryland CTE program of study, students also have the option to earn college credits and/or industry-recognized credentials such as certifications and licenses.

The Maryland CTE programs of study outlined in this document serve as a resource for local school systems and their community college partners. The programs included in this document are MSDE-developed programs designed with state and national-level partners, are standardized across the state, and include opportunities for state-wide professional development for teachers. For each Career Cluster, MSDE has identified several new Maryland CTE programs of study as outlined in this document.

The Maryland State Department of Education, in collaboration with business, higher education and local school systems, provides guidance and support for the ongoing development of rigorous and relevant CTE programs of study that prepare students for both college and careers. Local school systems are encouraged to adopt the Maryland CTE programs of study outlined in this publication and to partner with higher education in supporting student transition to postsecondary education and careers. The MSDE is also collaborating with school systems, business, labor and higher education to develop and expand CTE programs in high-demand careers, such as those in the Science, Technology, Engineering and Mathematics (STEM) disciplines.

Given that CTE programs are closely aligned with regional economic and workforce development priorities, not all high schools have programs in all Career Clusters. Based on local needs and opportunities, each school system decides which clusters and corresponding CTE programs to offer.

PREPARING TODAY FOR THE JOBS OF TOMORROW

CTE programs are designed to support students in making decisions about education and career options. While students generally enroll in a CTE program in 10th or 11th grade, career exploration begins far earlier. In middle school, students participate in career-awareness activities—for example, field trips, job-shadowing, and interest inventories—and develop high school plans, mapping out academic coursework and career options. Today, high school students face many options for academic growth and career exploration. Making informed choices about their high school program of study will prepare them for future success. For more information about Maryland's Career and Technology Education programs, go to: www.mdcteprograms.org.

SAMPLE HIGH SCHOOL PROGRAM OF STUDY

Students electing to complete a CTE Program as part of the high school program are prepared for entry into college and a career pathway. The chart below shows a typical high school program of study that includes a CTE Program Sequence beginning in Grade 10. It also depicts how students can earn industry certifications and/or college credit while in high school.

HIGH SCHOOL PROGRAM					COLLEGE PROGRAM
REQUIREMENTS	GRADE 9	GRADE 10	GRADE 11	GRADE 12	
English - 4	English 9	English 10	English 11 AP Language	English 12 AP Literature	English/Language Arts Include AP Credit options
Social Studies - 3	US Government	World History AP European	US History AP US History	Government AP Govt.	Humanities/Social Sciences Include AP credit options
Mathematics - 3 Required each year	Algebra I	Geometry	Algebra II	Trigonometry or Pre-Calculus or Calculus or AP Calculus	Mathematics Include AP credit options
Science - 3	Earth or Physical Science	Biology or AP Biology	Chemistry or AP Chemistry	Physics or AP Physics	Science Include AP credit options
Physical Education - .5 Health Ed - .5	.5 PE	.5 Health			
Fine Arts - 1	.5 Fine Arts	.5 Fine Arts			
Technology Education - 1	Foundations Of Technology	CTE Course (1)	CTE PROGRAM SEQUENCE CTE Course (1) Certification Exam	CTE Course (2) Certification Exam	CTE PROGRAM CONCENTRATION Include articulation options • Dual Enrollment • Credit by Exam • Youth-Apprenticeship
CTE Completer Program - 4					
Foreign Language - 2 and/or Advanced Tech Ed - 2	Foreign Language	Foreign Language	Foreign Language or Adv. Tech	Foreign Language or Adv. Tech	

In Maryland, all secondary and postsecondary programs are offered in related programs of study to advance student preparation and success in a career. However, specific program offerings vary by location. Contact the local school systems and/or community colleges who work together to identify areas of interest and program requirements.

In most CTE programs, the awarding of college credit and/or industry certification requires students to meet pre-determined standards and assessments as determined by the postsecondary institution and/or industry. A description of these requirements and opportunities for college credit and/or industry certification is included for each CTE program of study.

ARTS, MEDIA & COMMUNICATION

Maryland offers great opportunities for careers in the Arts, Media and Communication Career Cluster. Students interested in this cluster combine creative abilities with technical skills and knowledge that prepare them for careers in: Digital Media Production, Graphic Communications, Web Design, Interactive Media and Game Design. Maryland CTE programs include a focus on mass communication, graphic communication and multimedia production. Working with employers helps ensure that these programs keep pace with the industry. Students can earn industry certifications and college credit toward advanced study in their career field of interest.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Graphic Communications (PrintED) For more information about the Graphic Arts Education and Research Foundation and the PrintED program standards, please go to: www.gaerf.org/printed	The Graphic Communications (PrintED) program is offered in partnership with the Printing and Graphics Association Mid Atlantic (PGAMA). This program of study is designed to give students an overall understanding of the industry and its major operations while teaching academic and technical skills required in the field. Students can gain industry certification through PrintED in several areas, including: Digital File Preparation and Output, Digital Production Printing, Graphic Communications, Graphic Design, Offset Press Operations/Bindery and Finishing and Screen Printing. While gaining the technical skills they need to succeed in this career pathway, students can also earn college credits through articulation agreements.
Interactive Media Production **Digital Media** **Graphic Design** **Interactive Media** For more information about the related industry certifications for Adobe Creative Suite, please go to: www.adobe.com.	The Interactive Media Production (IMP) program includes a strong foundation in arts, technology and communication. The program starts with a foundation course in the Principles of Arts, Media and Communication. From there, students take two courses in Interactive Media Design that focus on digital media, interactive media and graphic design. The program concludes with a capstone course that emphasizes students' portfolio projects. Students gain experience in Internet technology and website development, computer graphics, electronic media and project management. Students have the opportunity to earn certification in Adobe Creative Suite or web design. Graduates may also earn college credit.

PRINT ED

PROGRAM HIGHLIGHT: GRAPHIC COMMUNICATIONS (PRINTED)

Twelve CTE Graphic Communications high school programs in Maryland are accredited by the Graphic Arts Education and Research Foundation's industry accreditation in PrintED. Students are eligible for college credit through statewide articulation agreements, and they can earn industry-recognized certifications in the following areas:

- Digital File Preparation and Output
- Digital Production Printing
- Graphic Design
- Introduction to Graphic Communications
- Offset Press Operations/Bindery & Finishing
- Screen Printing

BUSINESS MANAGEMENT AND FINANCE

Maryland CTE programs include a focus on financial services, accounting and finance, marketing, business management and business administrative support. These programs include options for students to earn industry certifications and college credit in a business-related career field. Students have the opportunity to take the College-Level Examination Program (CLEP) test in the areas of Financial Accounting, Principles of Management and principles of Marketing. The Advanced Placement (AP) Economics course is encouraged as a part of each program. Students may also participate in two Career and Technology Student Organizations: DECA or FBLA.

PROGRAM HIGHLIGHT: BUISINESS MANAGEMENT AND FINANCE

The Maryland State Department of Education in partnership with the MBA Research and Curriculum Center has worked to align BMF programs to the A*S*K (Assessment for Skills and Knowledge for business) assessment in finance, management, business and marketing. Additionally, participation in AP Microeconomics, AP Macroeconomics and the CLEP credit-by-examination program are encouraged as a part of each program. The CLEP credit-by-examination program and AP exam information can be found at www.collegeboard.org.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Academy of Finance (NAF) For more information about the National Academy Foundation and the Academy of Finance, please go to: www.naf.org.	The National Academy Foundation (NAF) Finance Academy provides students with a broad understanding of financial and economic concepts and provides internship opportunities. Students complete a series of courses including Principles of Finance, Accounting, Economics, Securities, Managerial Accounting, Financial Services, Ethics in Business and Applied Finance. Students may also complete a dual enrollment course or an internship to advance their understanding of careers in business and finance.
Accounting and Finance For more information about the Principals of Accounting CLEP exam, go to: www.collegeboard.org/clep. For more information about the A*S*K certification for Finance, please go to: www.mbaresearch.org.	In the Accounting and Finance program, students learn decision making techniques, financial management, basic accounting principles, business communication skills, problem solving, teamwork and networking skills. There is also a focus on advanced accounting and finance knowledge to prepare students for college level courses and entry-level positions in the workforce. Students may also complete a capstone project, dual enrollment or internship in accounting and finance. Students have the opportunity to take the A*S*K Certification for Finance and Principles of Accounting CLEP exam.
Marketing For more information about the Principles of Marketing CLEP exam, please go to: www.collegeboard.org/clep. For more information about the A*S*K certification for Marketing, please go to: www.mbaresearch.org.	In the Marketing/program, students learn about the consumer's role, research in global marketing, developing a marketing plan and the importance of ethics and social responsibility. Internships and mentored projects are included in the program. Students may also complete a capstone project, dual enrollment or internship in Marketing. Students have to the opportunity to earn college credit, complete the A*S*K Certification for Marketing and/or take the Principles of Marketing CLEP exam.
Business Administrative Services For information about the industry certification, please go to: www.microsoft.com/learning/mcp/officespecialist.	The Business Administrative Services program provides students with knowledge of how to effectively use technology in the analysis and communication of business principles. Students are required to complete Office Systems Management I and Office Systems Management II. The second course in the sequence includes coursework in Microsoft Office Applications preparing students for Microsoft Office Specialist (MOS) Certification for Microsoft Word and Excel.
Business Management For more information about the Principles of Management CLEP exam, please go to: www.collegeboard.org/clep. For more information about the A*S*K certification for Entrepreneurship/Management, please go to: www.mbaresearch.org.	The program begins with courses in Principles of Business, Management and Entrepreneurship and leads up to the Advanced Business Management course. This program prepares students for college-level programs in various areas of Business Management and the business world. Graduates may earn college credit through articulation agreements, dual enrollment, or by taking the Principles of Management CLEP exam. Students also have the opportunity to earn the A*S*K Certification for Entrepreneurship/Management.

CONSTRUCTION & DEVELOPMENT

Advances in science and technology will continue to drive innovation in the design, construction and maintenance of buildings. These advances will also impact infrastructure systems, including new design concepts, construction materials and methods and the application of information technology. Maryland high school construction-related programs allow students to advance their knowledge in design, construction management or construction trades professions.

PROGRAM HIGHLIGHT: CONSTRUCTION PROFESSIONS AND MAINTENANCE

Construction-related programs across the state are using the National Center for Construction Education and Research (NCCER) curriculum, resources and assessments to ensure student preparation and advancement in a wide range of construction careers. Industry partnerships across the state support Maryland students as they advance their technical and business knowledge through work-based learning opportunities and in many cases, through summer employment. Several of Maryland's community colleges use the NCCER standards, allowing students to make easier transitions from high school to college programs and apprenticeships.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Construction Design and Management For more information regarding industry certification, please go to: autodesk.com.	The Construction Design and Management (CDM) program is a four course project-based CTE Program of Study in which students develop an understanding of the built world through the design and construction process by completing and revising projects individually and in groups. All projects address increasingly complex questions, problems and challenges. Architectural drafting and design skills are developed through lab-based instruction using Autodesk software tools AutoCAD and Revit. Throughout the program, students develop a portfolio to demonstrate knowledge of each phase of the design and construction management process. The CDM program offers value-added opportunities such as AutoCAD certification, Revit certification and college credit through statewide articulation agreements with Morgan State University and the University of Maryland-Eastern Shore.
Construction Trades Professions • Carpentry • Electrical • Plumbing • Masonry For more information on program standards, certification and NCCER, please go to: nccer.org.	The Construction Trades Professions program is a four course hands-on program based on the National Center for Construction Education and Research (NCCER) standards and prepares students for further education and careers in the construction industry. Program pathway options include Carpentry, Electrical, Plumbing and Masonry. Each pathway option starts with a core curriculum course and then progresses through NCCER Level I curriculum and culminates in a capstone project, dual enrollment, work-based learning or apprenticeship opportunity. Additional curriculum modules are offered as supplemental resources and can support articulation to postsecondary Construction Management programs. Schools offering a Construction Trades Professions program must complete the NCCER accreditation process that ensures students have access to certification through the NCCER National Registry, a national recognized industry certification platform which is updated as students progress through the program.
Construction Maintenance Professions • Heating, Ventilation, Air Conditioning (HVAC) • Industrial Maintenance • Welding For more information on program standards, certification and NCCER, please go to: nccer.org.	The Construction Maintenance Professions program is a four course hands-on program based on the National Center for Construction Education and Research (NCCER) standards and prepares students for further education and careers in the construction industry. Program pathway options include Heating, Ventilation, and Air Conditioning (HVAC); Industrial Maintenance and Welding. Each pathway option starts with a core curriculum course and then progresses through NCCER Level I curriculum and culminates in a capstone project, dual enrollment, work-based learning or apprenticeship opportunity. Additional curriculum modules are offered as supplemental resources and can support articulation to postsecondary Construction Management programs. Schools offering a Construction Maintenance Professions program must complete the NCCER accreditation process that ensures students have access to certification through the NCCER National Registry—a national recognized industry certification platform which is updated as students progress through the program. Students who pursue welding may earn industry-recognized credentials issued by the American Welding Society (AWS), as students progress through the program. Welding meets AWS standards.

CONSUMER SERVICES, HOSPITALITY AND TOURISM

Programs in consumer services, hospitality and tourism prepare students for a variety of career options and further education. Each program includes options for students to earn industry certifications and/or college credit in a career field of interest. Students who pursue programs in culinary arts, restaurant management, lodging management or cosmetology engage in real-world experiences through internships and mentoring opportunities. These options allow students to apply their classroom instruction in meaningful ways and they give them (through licensure or certification) a jump start into the profession.

American Culinary Federation

PROGRAM HIGHLIGHT: CULINARY ARTS

The American Culinary Federation (ACF) program prepares students for careers and further education in professional cooking or baking. Nineteen Maryland high schools are accredited in culinary arts and/or professional baking —a one and a half year process that includes curriculum review, site visits, and assessments. The ACF programs at Easton High School in Talbot County and Worcester Technical High School in Worcester County have earned Exemplary Status by the American Culinary Federation Education Foundation.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Culinary Arts (ACF) • Professional Cooking • Professional Baking For more information about industry standards, certification and the ACF, please go to: www.acfchefs.org.	The Culinary Arts program partners with the American Culinary Federation (ACF) to prepare students for successful careers in the food and beverage industry with a focus on Professional Cooking or Professional Baking. The program includes education in food production, professional cooking, baking, cost control, nutrition, sanitation and food marketing. Students may earn ACF's Certified Junior Culinarian credential and may also earn articulated college credit at Stratford University through a statewide articulation agreement.
Food and Beverage Management (ProStart) For more information about industry standards, certification and the professional organizations, please go to: • RAMEF – www.ramef.org • NRAEF – nraef.org/prostart	In partnership with the Restaurant Association of Maryland Education Foundation (RAMEF) and the National Restaurant Association Educational Foundation (NRAEF), the ProStart program introduces students to a wide variety of careers within the restaurant, food service and hospitality industry. Students study and practice professional food preparation, international cuisines, food safety and sanitation, customer service relations, accounting, cost control, marketing and lodging management. As part of the program, students complete an industry-mentored, work-based learning experience.
Hospitality and Tourism Management Program (HTMP) For more information about industry standards and the industry certification CHTMP, please go to: www.ahlei.org/Programs/High-School-Program-HTMP)/.	The Hospitality and Tourism Management Program (HTMP), is a nationally recognized program developed by industry experts and members of the American Hotel & Lodging Association that offers the Certified Hospitality and Tourism Management Professional credential. Students enrolled in the program build business and management skills related to the lodging and tourism industry. The tourism industry offers significant job creation across all regions with tremendous success for long-term career pathways. Tourism is recognized as a major driver of economic growth and development in Maryland.
Careers in Cosmetology For more information about industry requirements and licensing in Maryland, please go to MD State Board of Cosmetology at www.dllr.state.md.us.	The Careers in Cosmetology program prepares individuals to care for and beautify hair, skin and nails. Students are instructed in the art and science of cosmetology as well as all aspects of the industry. Emphasis is placed on hygiene, safety and sanitation as well as State Board of Cosmetologists' rules and regulations. Related areas of instruction include human anatomy and physiology, mathematics/measurement and chemistry. Salon management is an integral part of the classroom and clinical experience. The 1,500 hour program includes classroom instruction, clinical experience, related mentored work-based learning experiences and a senior capstone project. Upon successful completion of the program, the students are prepared to take the Maryland State Board of Cosmetologists' Examination for licensure as a Cosmetologist.

ENVIRONMENTAL, AGRICULTURE & NATURAL RESOURCES

The agricultural sector is a highly competitive industry creating new challenges in identifying global and domestic markets; improving business planning, financing, risk management, and productivity; and reducing costs. Advances in science and technology, in particular biotechnology, will continue to drive innovation and growth in this Career Cluster. Growing public concerns over natural resources, environmental quality and public health will continue to expand the role and scope of the natural resource management and environmental services sectors.

"CASE is the most powerful tool available for the advancement of agricultural education and enhancement of student learning of agricultural science subject matter."

-National Association of Agricultural Educators

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Curriculum for Agriculture Science Education (CASE) • Animal and Plant Biotechnology • Food Science and Safety • Natural Resources For more information, please go to www.case4learning.org	The Curriculum for Agriculture Science Education (CASE) is a national program of study that offers students a rigorous curriculum designed to challenge students to perform at high levels. Through the use of activities, projects and problem-solving, students explore agriculture subject matter while they learn necessary knowledge and skills. To establish these requirements, CASE incorporates the National Academic Standards and Agriculture Food and Natural Resources (AFNR) Content Standards. The program is a four-course sequence and offers students the opportunity to earn college credit through articulation agreements, upon successful program completion. For more information about CASE, please see the program highlight at the bottom of this page.
Horticultural Services: Certified Professional Horticulturalist (CPH) For more information about industry requirements, please go to Maryland Nursery and Landscape Association: www.mnlga.org.	The Horticultural Services program of study is based on requirements for the Certified Professional Horticulturist (CPH)—credentials recognized by the Maryland Nursery Landscape and Greenhouse Association. Students complete a sequence of courses which include: Introduction to Environmental/Plant/Animal Science, Foundations of Horticulture, Plant Production and Landscape Design and Management. Students have the opportunity to earn the student-level CPH certification by taking and passing the industry exam.
Environmental Studies/Natural Resources	The Environmental Studies/Natural Resources program of study is composed of a four-course sequence that covers both environmental and natural resource management technologies and current issues related to these fields of study. The program includes an emphasis on research and the ethics involved in making decisions that impact our ecosystem. Students will engage in technical research and writing as it relates to real-world problem solving. They will also have the opportunity to earn college credit through articulation agreements with Maryland colleges.

CASE
Curriculum for Agricultural Science Education

PROGRAM HIGHLIGHT: CURRICULUM FOR AGRICULTURE SCIENCE EDUCATION (CASE)

In this program, students learn about all aspects of agricultural sciences and may take additional courses based on their area of interest. The following courses are offered as part of the program:

- Introduction to Agriculture, Food and Natural Resources
- Principles of Agricultural Sciences | Plant
- Principles of Agricultural Sciences | Animal
- Animal and Plant Biotechnology
- Food Science and Safety
- Agricultural Business, Research and Development

HEALTH & BIOSCIENCES

Career and Technology Education programs in the Health and Biosciences Cluster focus on preparing dedicated professionals with the knowledge and skills necessary to pursue challenging and rewarding careers and further education. These programs require students to apply knowledge learned in science and mathematics to professions in the Health and Biosciences field. These careers are among the fastest growing and highest in demand in the country as the population ages and health care needs continue to increase. These CTE programs prepare students for positions in direct patient care settings and research and laboratory facilities, as well as for opportunities in business and management related to health care. The Health and Biosciences Cluster also provides career development experiences for students who want to pursue careers in the medical professions including physicians, research scientists, nurses and a wide more.

BEVERLY K. FINE SCHOOL of the SCIENCES
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Maryland leads the world in adult stem cell production and vaccine development, and represents one of the largest life science clusters in the U.S. with 500+biotech firms, 2260 life sciences companies, the NIH, the FDA, Johns Hopkins University, and the University of Maryland. Maryland companies work in agriculture and marine biology, biodefense, clean technology, food safety and human/animal health.

- Maryland Department of Commerce

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Academy of Health Professions (AHP) • Certified Nursing Assistant (CNA) • Pharmacy Technician • Dental Assistant • Certified Clinical Medical Assistant • Physical Rehabilitation	The Academy of Health Professions program uses project and problem-based learning and clinical experiences as well as classroom and lab instruction to teach students about the field of health care. Students progress through two foundation courses: Foundations of Medicine and Health Science and Structure and Functions of the Human Body. Opportunities for students to apply what they are learning to real-life health care situations are part of the specialized health care courses. Students also have the opportunity to earn state and/or nationally recognized industry certifications and/or college credit through articulation agreements with local colleges. Stevenson University provides on-going curriculum and professional development to AHP teachers and transcripted college credit to students who successfully complete the program.
Biomedical Science: Project Lead The Way (PLTW) For more information about Project Lead The Way, please go to: stevenson.edu/academics/schools/school-sciences/stem-initiatives/project-lead-the-way/index.html, pltw.org or biotility.research.ufl.edu.	PLTW Biomedical Science empowers students to build knowledge and skills in biomedical science, as well as in-demand, transportable skills like problem solving, critical and creative thinking, communication and collaboration. The program consists of a sequence of four courses: Principles of Biomedical Science, Human Body Systems, Medical Interventions, and Biomedical Innovation. Students who complete the program are prepared for employment and further education. Stevenson University, Maryland's PLTW Biomedical Sciences Affiliate University, offers transcripted college credit to students who successfully complete the program and meet specified requirements. Students who complete the Biomedical Science program may also take the Biotechnician Assistant Credentialing Exam (BACE)—an industry-recognized credential through which students demonstrate mastery of knowledge and skill sets valued by the bioscience industry when hiring for entry-level positions.

PROJECT LEAD THE WAY PLTW

PROGRAM HIGHLIGHT: BIOMEDICAL SCIENCE

The Project Lead The Way (PLTW) Biomedical Science program is one of Maryland's leading STEM focused Career and Technology Education programs of study. The PLTW Biomedical Sciences (BMS) Program is a sequence of courses that are aligned with appropriate national learning standards, which follows a proven hands-on, real-world problem-solving approach to learning. Students explore the concepts of human medicine and are introduced to topics such as physiology, genetics, microbiology and public health. Through activities, like dissecting a heart, students examine the processes, structures and interactions of the human body-often playing the role of biomedical professionals. They also explore the prevention, diagnosis and treatment of disease while working in teams to investigate and design innovative solutions to the health challenges of the 21st century—such as fighting cancer with nanotechnology. The PLTW BMS program is preparing students for careers in this field by giving them the tools they need to compete and win in a rapidly changing 21st century economy.

HUMAN RESOURCE SERVICES

Advances in scientific knowledge and increased public awareness of social problems and issues are contributing to a demand for high-quality social services. Public concerns over crime and the increased demand for legal intervention in businesses and communities will continue to drive the growth of law enforcement, emergency services and legal services. The continuous need for professionals in education fields, especially in the critical shortage areas, offers creative ways to engage young people early on in the teaching profession.

TOWSON UNIVERSITY™

PROGRAM HIGHLIGHT: TEACHER ACADEMY OF MARYLAND (TAM)

The Teacher Academy of Maryland (TAM) introduces students to the teaching profession and gives them a jump start on college coursework. TAM students can enroll directly in a four-year college with a teacher education program, netting credit for their high school program. They can also enroll in any of the 13 community colleges statewide that offer the articulated Associate of Arts in Teaching degree - a two-year degree with coursework that transfers to any in-state, four-year college (public or private) with a teacher-preparation program. Towson University, which graduates the largest number of teacher candidates in the state, is the program partner, offering transcripted credit and scholarships to TAM graduates as well as professional development to teachers.

For more information please go to: http://www.towson.edu/coe/tam.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Fire Emergency Medical Training/High School Cadet – Fire Science: Maryland Fire and Rescue Institute (MFRI)	The Fire Emergency Medical Training/High School Cadet program is offered in partnership with instructors from the Maryland Fire and Rescue Institute (MFRI) of the University of Maryland. Students progress through courses on fire prevention and control and emergency medical technology. The program includes classroom instruction and training at local fire companies. Students are required to complete work-based learning and take eight certification exams.
Homeland Security and Emergency Preparedness Programs: • Homeland Security Sciences • Criminal Justice and Law Enforcement • Information and Communications Technology	The Homeland Security and Emergency Preparedness (HSEP) programs prepare students for industry certification and college credit in one of three program options: Homeland Security Sciences, Criminal Justice and Law Enforcement or Information/Communications Technology. All students complete a foundation-level course with a focus on protecting against threats to public safety through effective communication, preparedness, detection, prevention, response and recovery. Students completing the Homeland Security Sciences program complete additional courses in Homeland Security Science Research Methods and Applications. Students completing Criminal Justice and Law Enforcement complete additional courses in Administration of Justice and participate in an internship as part of the program. Students in the Information/Communications Technology courses focus on Geographic Information Systems (GIS) and Remote Sensing (RS) technology—leading to the ERSI ArcGIS Desktop Entry Certification. All areas conclude with a capstone project mentored by industry partners.
Early Childhood Education – Infants/Toddlers Child Development Associate (CDA) "Coming Soon" Early Childhood Education - Preschool Child Development Associate (CDA)	The Early Childhood Education - Infants/Toddlers CDA follows the high school Child Development Associate (CDA) Program. Upon successful completion of the program, students are eligible for certification issued by The Council for Professional Recognition. The CDA is a nationally-transferable, most widely recognized, credible and valid credential in the Early Childhood Education field. Students may earn the CDA in center-based programs, family child care and home visitors. Students complete 120 clock hours of child development education and 480 hours of experience working directly with children in licensed facilities. In addition to industry certification, students also have the opportunity to earn college credit.
Teacher Academy of Maryland (TAM) For more information about teaching requirements go to : www.marylandpublicschools.org. For more information about the ParoPro certification, please visit: www.ets.org.	The Teacher Academy of Maryland program prepares students for further education and careers in the education profession. The program focuses on human growth and development through adolescence, teaching as a profession, curriculum and instruction, and an education academy internship. Upon completion of the program and passing the ParaPro assessment, high school graduates are ready for employment in the teaching profession. This program is based on the outcomes of the Maryland Associate of Arts in Teaching (A.A.T.) degree. Students can receive college credit and scholarships to several Maryland baccalaureate teacher education programs.

INFORMATION TECHNOLOGY

Information Technology (IT) professionals will face increasing pressure to design, develop, implement, and support more complex and reliable IT solutions that will meet the needs of external and internal customers. This will require that IT professionals have the skills to determine customer and business needs and requirements, manage complex projects, and integrate software and hardware solutions. Maryland CTE programs include opportunities for students to focus on software development, programming, IT hardware and networking technologies. Cyber Security is an increasingly important part of IT programs and represents expanding opportunities for employment and advanced education and training in Maryland.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Java Database Academy (Oracle) For more information about industry standards, certification and the ACF, please go to: www.academy.oracle.org.	The Java Database Academy leverages Oracle's global technology leadership to offer a complete portfolio of computer science education resources to secondary schools with the goal of helping students become college and career ready. Students develop IT and business skills using production software that is common in hundreds of industries—and educators keep pace with current technology through ongoing professional development. The program is comprised of two pathways that lead to Oracle Associate Junior Certifications. Oracle Pathways: Java Programming and Database Programming
IT Networking Academy (CISCO) For more information about the Cisco Academy and Cisco certifications, please go to: www.netacad.com.	The IT Networking Academy (Cisco) introduces students to both the physical and logical sides of networking. The program focuses on troubleshooting common networking issues with a strong emphasis on the security and documentation of network topology. Four pathway options prepare students to be career ready in the IT industry or continue their preparation at a postsecondary IT program. Students learn content that can lead to a range of industry certifications, including CompTIA's ITF, A+, Network+, Security+, and PenTest+. Cisco's ITF, CCENT, CCNA, CCNA Security, and Cyber Ops. NDG Linux Certification. Cisco Pathways: Certified Entry Network Technician, Certified Network Associate, Cybersecurity and Cyber Security Operations.
PLTW Computer Science For more information about the Computer Science program, go to: www.pltw.org.	The Project Lead the Way (PLTW) Computer Science program engages high school students in real-world activities like using automation to process and analyze DNA-sequence data. The PLTW projects and problems cultivate students' computational thinking, challenge them to think big, and help illustrate how intricately computer science is woven into our society. The College Board recognizes PLTW as an endorsed provider of curriculum and professional development for Advanced Placement (AP) Computer Science Principles (AP CSP). The program culminates in a cybersecurity course that includes a virtual cyber range where students learn to detect IT system vulnerabilities.

PROGRAM HIGHLIGHT: IT NETWORKING ACADEMY (CISCO)

The IT Networking Academy (Cisco) prepares students for advanced study in a wide range of IT careers, including networking, cabling and wireless technologies. Approximately 2,500 students are enrolled in Cisco Academies across Maryland at the high school and college level. Cybersecurity is an increasingly important part of Information Technology (IT) programs and represents expanding opportunities for employment and advanced education in Maryland, which is home to: More than 12,000 IT and cybersecurity companies, 60+ government agencies tasked with protecting our nation from cyber-crime, including the National Security Agency, The National Cybersecurity Center for Excellence, The U.S. Cyber Command and 17 higher education institutions that have been designated National Academic Centers of Excellence in Cyber Defense.

MANUFACTURING, ENGINEERING, AND TECHNOLOGY

Programs in the Manufacturing, Engineering, and Technology Cluster prepare students for a variety of career areas, including opportunities to become engineers, engineering technologists or technicians. Students engage in real-world projects that strengthen their understanding of science, technology, engineering, and mathematics (STEM). By completing challenging projects related to design, manufacturing process applications and quality improvements, they are being educated for the high-performance workplace using advanced technologies. To remain internationally competitive, employers need employees who can develop and use new technologies that will continuously improve the quality of life for Marylanders.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Project Lead The Way Engineering: • Aerospace Engineering • Civil Engineering and Architecture • Computer Integrated Manufacturing • Computer Science Principles • Environmental Sustainability For general information about PLTW, please go to: www.pltw.org.	The Project Lead The Way (PLTW) Engineering: program prepares students for further education and careers in engineering and engineering technology. Students complete foundation-level courses in Engineering, including Introduction to Engineering Design, Principles of Engineering and Aerospace Engineering, Civil Engineering and Architecture, Computer Integrated Manufacturing, Computer Science Principles, or Environmental Sustainability. In the final course, students complete an industry-mentored capstone project in Engineering Design and Development. Students who qualify can earn transcripted credit at PLTW–affiliated colleges and universities nationwide, including the University of Maryland, Baltimore County.
Manufacturing Engineering Technologies • Manual Milling • Turning Operations Between Centers • Turning with Chucking • Grinding • Drilling Operations • CNC Turning Operations • CNC Turning: Programming Set-up & Operations • CNC Milling Operations • CNC Milling: Programming Set-up & Operations For general information about NIMS credentials, please go to: www.nims.org.	This program prepares students for a beginning career in manufacturing and machine technologies and aligns to the National Institute of Metalworking Skills (NIMS) Machining Level I Credentials. Students participate in hands-on education in precision machining while developing competency in process control, manual operations, process adjustment, and part inspection. They must also demonstrate machine safety. Students enrolled in the MET-NIMS CTE program of study must complete the NIMS accreditation process. The program includes four credentialing areas—two required by NIMS and two selected by the school system. Students must complete at least one credentialing area.

PROGRAM HIGHLIGHT: PROJECT LEAD THE WAY (PLTW) ENGINEERING

PLTW contributes to a strong, positive impact on mathematics and science achievement and offers a pathway to prepare and motivate students to enter careers in engineering and science. Maryland's PLTW Engineering program is focused on increasing the number of students prepared for college and STEM-related careers—specifically women and minorities who are underrepresented in the field. Below are some Maryland manufacturing facts from the U.S. Bureau of Economic Analysis and the U.S. Census Bureau:

- Manufacturers in Maryland account for 5.5 percent of the total output in the state, employing 4.0 percent of the workforce.
- Total output from manufacturing was $20.67 billion in 2016.
- There were 106,800 manufacturing employees in Maryland in 2016, with an average annual compensation of $84,969 in 2016.

"A solid foundation in math and science broadens the higher education and career opportunities available to students. Students who participate in Maryland's PLTW Engineering Program arrive at our campus well-prepared to complete a degree in engineering or another STEM-related field."

- Freeman Hrabowski, President
UMBC - PLTW Affiliate University

TRANSPORTATION TECHNOLOGIES

Advances in science and engineering are producing major innovations in transportation technology, resulting in faster movement of people and goods at lower costs and with less environmental and safety risks. These innovations require higher level skills to manage and maintain transportation equipment. High school programs provide opportunities for students to prepare for careers in the automotive industry.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Automotive Technician (ASE) For more information about the Automotive Service Excellence (ASE) Education Foundation standards and industry certification, please go to: www.aseeducation.org.	The Automotive Technology program incorporates the Automotive Service Excellence (ASE) program certification standards. The ASE accreditation model has been updated and broadened to include all eight certification areas: Suspension and Steering, Brakes, Electrical/Electronic Systems, Engine Performance, Engine Repair, Heating and Air Condition, Automatic Transmission and Transaxle, and Manual Drive Train. Each course is aligned to industry requirements for certification and success in the field. The end-of-course assessments provide students the opportunity to earn up to four ASE student certifications as well as college credit.
Autobody/Collision Repair Technician (ASE) For more information on Autobody/Collision Repair Technician (ASE), please go to ASE at www.aseeducation.org or to the Inter-Industry Conference on Auto Collision Repair, (I-CAR) at www.i-car.com.	The Autobody/Collision Repair Technician program combines technical, academic, and workplace skills in an integrated curriculum in accordance with the Automotive Service Excellence's (ASE) guidance and directives and from the Inter-Industry Conference on Auto Collision repair (I-CAR). The program consists of the following courses: Non-Structural Analysis & Damage Repair, Paint and Refinishing, and Structural Analysis and Damage Repair. Each course has an ASE end-of-course assessment providing students the opportunity to earn ASE student achievement certificates and college credit.
Medium-Heavy Truck Technician (ASE) For more information about the ASE standards and industry certification, please go to: www.aseeducation.org.	The Medium/Heavy Truck Technician program combines technical, academic and workplace skills in an integrated curriculum in accordance with all ASE guidance and directives. The program consists of the following courses: Diesel Engineering, Suspension and Steering, Brakes, Electrical/Electronic Systems, and Preventive Maintenance. Each course has an ASE end-of-course assessment providing students the opportunity to earn ASE student achievement certificates and college credit.

Education Foundation

PROGRAM HIGHLIGHT: AUTOMOTIVE TECHNICIAN

The ASE Education Foundation was founded to develop, encourage, and improve automotive technician education. ASE examines the structure and resources of training programs and evaluates them against nationally accepted standards of quality. ASE's precise national standards reflect the skills that students must master. The ASE evaluation process ensures that accredited training programs meet or exceed industry-recognized uniform standards of excellence.

WORK-BASED LEARNING

Supervised work-based learning allows high school students on-the-job experiences related to their career choice. Students may also elect to complete work-based learning through participation in a CTE program, Career Research and Development (CRD) or through the Apprenticeship Maryland (AMP) program. The programs are designed to link instruction with specific work experiences. These linked learning experiences are organized around a plan that is cooperatively developed by the student, a work-based learning coordinator, and employer to add value to and extend a student's career preparation. Students in CRD or AMP can be placed in positions related to any of Maryland's 10 Career Clusters.

HIGH SCHOOL CTE PROGRAM	DESCRIPTION
Career Research and Develop-ment (CRD) Stevenson University is the affiliated partner with CRD. For more information about the CRD curriculum, please go to: www.crd-msde.org.	The Career Research and Development (CRD) is a CTE program that prepares students with the academic, technical and workplace skills necessary to seek further education and employment in a career field of their interest upon graduating high school. Students learn how to effectively plan for their future by defining their employment, education and goals; building financial literacy skills; and integrating the Maryland's Skills for Success as they begin to manage their career and educational choices. The program consists of two in-school courses and a work-based learning component. The work-based learning (WBL) experience takes place at the worksite, includes a minimum of 270 hours, and may be paid or unpaid. This experience is directed by an agreement that is developed by the student, WBL coordinator, and employer. The WBL plan identifies the appropriate academic, technical, and workplace readiness competencies that apply directly to students' goals for a specific work-related placement.
Apprenticeship Maryland (AMP) For more information about the AMP program, please go to: www.marylandpublicschools.org or www.dllr.state.md.us.	The Apprenticeship Maryland (AMP) program is the result of a partnership between the Maryland State Department of Education and the Department of Labor, Licensing and Regulation. The program provides high school students with all aspects of an apprenticeship experi-ence including work-based learning, related classroom instruction, and one-on-one mentoring from an industry professional. In addition to the traditional pathways, students are encouraged to participate in youth apprenticeships leading to sustainable employment and further education in manufacturing and Science, Technology, Engineering, and Mathematics (STEM) occupations. Participating students start the program in their junior or senior year and complete at least one year of related classroom instruction and a minimum of 450 hours of work-based training under the supervision of an eligible employer. The workplace component is a paid (at least minimum wage) mentored, on-the-job work experience with a written learning plan and a formal agreement among the student, school and employer.

EARN AND LEARN WITH Apprenticeship Maryland

PROGRAM HIGHLIGHT: APPRENTICESHIP MARYLAND (AMP)

Piloted in Frederick and Washington Counties in 2015, AMP is now a CTE program of study that is available to local school systems across the state of Maryland. This program is designed to prepare students to enter the workforce by providing on-site employment training while being provided classroom instruction needed to obtain a license or certification for a skilled occupation. It is a win-win for students and employers. It allows students to jumpstart into existing adult apprenticeships or full-time employment upon graduation. Employers are able to enhance employee retention while saving money on wages while providing customized training.

Apprenticeship Maryland: Grow Local, Hire Local!

CAREER & TECHNOLOGY EDUCATION

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