

# MARYLAND CAREER CLUSTERS



RESTRUCTURING LEARNING FOR STUDENT ACHIEVEMENT  
IN A TECHNOLOGICALLY ADVANCED, GLOBAL SOCIETY



Second Edition  
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*“Public education is a joint investment. We must all work together to see that our curriculum is relevant and reflective of the real world. Our students must be actively engaged in the learning process and must have the knowledge and skills they need to transition successfully from school to postsecondary education and careers.”*

Dr. Nancy S. Grasmick  
 State Superintendent of Schools  
 Maryland State Department of Education

*“We are indebted to the over 350 Maryland employers who partnered with us to create a system of Career Clusters that will allow CTE instruction to keep pace with the 21st century economy.”*

Katharine M. Oliver  
 Assistant State Superintendent  
 Maryland State Department of Education

*“Maryland’s Career Clusters will ensure that Career and Technology Education programs are aligned with GWIB’s demand-driven Industry Initiative that seeks to ensure an educated, qualified workforce for the State’s employers.”*

Robert Seurkamp  
 Executive Director  
 Governor’s Workforce Investment Board

Maryland Career Clusters: An Overview	1
Guide to Maryland’s 10 Career Clusters	5
Career Cluster 1: Arts, Media, and Communication	6
Career Cluster 2: Business Management and Finance	10
Career Cluster 3: Construction and Development	14
Career Cluster 4: Consumer Services, Hospitality, and Tourism	17
Career Cluster 5: Environmental, Agricultural, and Natural Resources Systems	22
Career Cluster 6: Health and Biosciences	26
Career Cluster 7: Human Resource Services	31
Career Cluster 8: Information Technology	35
Career Cluster 9: Manufacturing, Engineering, and Technology	39
Career Cluster 10: Transportation Technologies	44

## Maryland Career Clusters

### MARYLAND CAREER CLUSTERS HELP HIGH SCHOOLS WORK SMARTER IN TODAY'S COMPETITIVE ECONOMY.

Maryland Career Clusters are driven by what students need to know and do in order to be fully prepared for further education and careers in the 21st-century global economy. Career Clusters provide an important context for educational reform efforts as outlined in the Maryland State Department of Education's (MSDE) Achievement Matters Most: Maryland's Plan for Every Student and the Policies and Procedures for the Development and Continuous Improvement of Career and Technology Education (CTE) Programs. Under the guidance of MSDE, Maryland business, industry, and labor leaders organized the state's Career Cluster system.

Career Clusters have been embraced nationally at both secondary and postsecondary levels. Maryland is a recognized leader in successfully adapting the national framework to the state's economy and education reform. Local school systems and community colleges, along with other providers of postsecondary education, are using the Career Cluster system to organize teaching and learning to meet the specific needs and resources of their communities.

Career Clusters also help enhance economic development. They are groupings of interrelated occupations that represent the full range of career opportunities. By connecting educators and employers, career clusters provide a common framework to help ensure that Maryland has a high-quality workforce that attracts and retains businesses to the state.

### MORE RELEVANT

At a time when the need for skills-driven education and high academic and technical achievement is greater than ever,

While nearly 80 percent of America's high school graduates enroll in college, an increasing number require remedial help at the outset. And overall, less than half of four-year college students complete the degree within five years.

we're losing many of our high school students to indifference.

Students are struggling to find the relevance that coursework will have on their future.

Too often students graduate inadequately prepared for challenging careers and the rigors of continued learning.

Maryland Career Clusters promote student success by relating students' educational experiences to their future goals and aspirations. Seeing the relevance of education, more students can reach high levels of performance, thus closing the achievement gaps.

### MORE FOCUSED

Maryland high schools are changing to better prepare every student for success after high school in higher education and challenging careers. The Maryland Career Clusters system directs students toward focused programs of study that make the high school experience more meaningful. Not unlike choosing a subject major in college, Career Clusters provide students an opportunity to select a field of interest while they are still in high school. They focus students and provide a variety of career options to pursue. When students are interested and engaged, learning takes place.

Concentrated learning in a given subject area is not a new concept in Maryland. Many local school systems have in place focused programs of study, such as the International Baccalaureate; Performing Arts Magnets; Math, Science, and Technology Signatures; and Finance Academies. Career Clusters are a resource for high schools as they reorganize into smaller learning communities. Instruction is organized around career themes, providing more students the opportunity to explore career choices while still in high school and enroll in pathway programs that enable them to successfully transition from high school to postsecondary education.

Similarly, community colleges are adapting career clusters as a means of organizing degree programs to ease the transition of students from high school and provide focused programs of study. Because learning is a lifelong process, Maryland educators have taken steps to ensure that high school students can readily transition to two-year colleges, four-year colleges, or other postsecondary education to reach their goals. Through articulated Tech Prep and CTE pathway programs, students take a sequence of courses beginning in high school and continuing at two- or four-year colleges without repeating material already mastered.

The 10 Career Cluster frameworks include listings of available career options with an associate's degree or less, a bachelor's degree, or more than a bachelor's degree.

# Maryland Career Clusters

## MORE PREPARED

Today’s knowledge-based economy demands continuous learning and innovation. It calls for a highly skilled and flexible workforce with the ability to work in cross-functional teams with people from diverse cultural and educational backgrounds. The focus is no longer on performing a single job or task. To be successful, students must be able to:

- Understand the educational requirements for success in college and the workplace;
- Manage their own careers and their need for continuing education in a constantly changing environment; and
- Identify and seek career advancement opportunities.

## MORE PRODUCTIVE

Career Clusters allow business leaders to be partners in education where students can participate in more extensive career development opportunities. As a result, students aspire to learn and determine their own education and career goals. Career Clusters create clear and smooth educational pathways young people can follow from kindergarten through grade 12, on to community college or other postsecondary education, and into the workplace. Throughout high school and postsecondary education, students participate in a variety of work-based learning opportunities that assist in determining their future career development and career goals.

FEATURES AND BENEFITS OF MARYLAND CAREER CLUSTERS	
FEATURES	BENEFITS
Aligns teaching and learning with students’ interests.	When students are interested in what they’re learning, they stay involved and perform better.
Helps students become more self-directed and focused on their future.	Students who set goals achieve greater success in high school, community college and beyond.
Relates classwork to students’ goals and interests.	Students are motivated to work harder, enroll in more challenging courses, and make better career choices.
Provides a framework for organizing high schools into smaller learning communities.	Students receive more personalized instruction, advice, and support.
Aligns high school programs of study to college and workplace requirements.	Programs of study ready students for college and eliminate the need for remediation.
Organizes career opportunities into 10 Career Clusters.	Students, parents, and advisors understand future career possibilities, thus facilitating career decision-making.
Anticipates and responds to changes in the economy.	Business and community leaders continue to keep educators informed on the changing requirements of the workplace.
Guides the continuous improvement of career and technology education programs.	Students can earn industry credentials, and/or gain advanced standing in college and careers.
Aligns course content to state standards.	Student achievement increases and dropout rates decrease.

*“Two years after graduating high school, I received my Associate Degree in Nursing. I attended college classes while still in high school and over each summer. The advantage to participating in this program was I could work part time, while still living at home. This program was fast paced and intense, but it was worth every minute. I love nursing and am very proud to be a Registered Nurse.”*

Tiffany Edwards  
Associate Degree in Nursing  
College of Southern Maryland

*“Career clusters and pathways are designed to make options for students easy to understand. In that way, students are able to make better and more informed decisions about their future careers, inspiring them to do their very best while still in high school.”*

Shelley A. Johnson  
Director, Career and Technology Education  
Montgomery County Public Schools



## Maryland Career Clusters

CAREER CLUSTERS ARE ORGANIZED AROUND 10 BROAD CAREER AREAS THAT REFLECT MARYLAND'S KEY ECONOMIC SECTORS.

Each Maryland Career Cluster encompasses a range of careers based on essential economic activities, similar interests, common skills, and training required by those in the field. When students pursue a Career Cluster, they can still explore coursework in related clusters.

Maryland's system encompasses virtually all careers and levels of education—from entry level to professional level—in the following 10 Career Clusters:

1. Arts, Media, and Communication
2. Business Management and Finance
3. Construction and Development
4. Consumer Services, Hospitality, and Tourism
5. Environmental, Agricultural, and Natural Resources Systems
6. Health and Biosciences
7. Human Resource Services
8. Information Technology
9. Manufacturing, Engineering, and Technology
10. Transportation Technologies

*“I enrolled in the Academy of Finance because of the internships. Now that I’m in college, I’m motivated to take more advanced courses and to learn about the variety of careers that are available to me.”*

Kim Wefelmeyer  
High School Graduate  
Northeast High School, Anne Arundel County

*“Over the past two decades, 12th graders have reported a declining interest in school, while the effort they apply to their school work has generally shown no measurable change over the past decade.”*

*The Condition of Education 2002*  
National Center For Education  
United States Department of Education

*“The partnerships being forged between the business community, state and local economic development officials and educators are a critical element of workforce development in Maryland. In the new fast-paced, global economy, it is no longer sufficient to prepare workers for today’s jobs; we must teach students the skills they will need to fill the jobs of tomorrow.”*

Aris Melissaratos,  
Maryland Secretary of Business and Economic Development

*“The implementation of career clusters in the Cecil County Public Schools’ high school curricula has facilitated student determination of career goals and defined a focused grades 9-16 educational plan for all students.*

*The career cluster model has enhanced postsecondary and business partnerships and increased the rigor and relevance of the courses that students select.”*

Mary Etta Reedy  
Executive Director for High School Education

## Maryland Career Clusters

### USING CAREER CLUSTERS, STUDENTS IDENTIFY CAREER OPTIONS CALLED CAREER PATHWAYS

Maryland business leaders worked with MSDE to define the core functions of each industry represented by the Career Cluster. These core functions became the Career Pathways for each cluster. The Career Pathways include a range of career opportunities. Because each Career Cluster is broadly defined, there is overlapping and common content across clusters, allowing for flexibility in program design.

Career Pathways are like road maps of learning that help students plan for and pursue further education and careers. Students can explore a wide range of career options that require postsecondary education and training. Students also have opportunities to apply academics and develop technical skills in a career area.

Educators use the cluster materials to develop sequential programs of study that include at least the last two years of high school and two or more years of postsecondary education.

Programs provide multiple options for students (such as early college admissions through dual enrollment, articulated credit, and advanced placement at two- and four-year colleges) as they prepare for further education and careers. Career and Technology Education programs of study also prepare students to earn industry-recognized credentials.

As shown in the diagram below, a high school may be organized around four Career Clusters and multiple pathways. An example of one related, CTE-focused program of study is provided for a Career Pathway within each cluster.

Not every pathway will have a corresponding program of study. However, counselors and parents must be aware of the entire scope of the industry as they guide students in preparing for college and careers.

CAREER CLUSTERS			
INFORMATION TECHNOLOGY	HEALTH AND BIOSCIENCES	ARTS, MEDIA, AND COMMUNICATIONS	MANUFACTURING, ENGINEERING, AND TECHNOLOGY
CAREER PATHWAYS			
Software Operations	Health Services	Print and Broadcast Journalism	Project Engineering
Hardware Operations	Infomatics	Visual Arts	Manufacturing Process and Quality Assurance
	Basic/Applied Research	Multimedia Production	Logistics and Inventory Control
	Manufacturing	Graphic Design and Printing	
EXAMPLES OF HIGH SCHOOL PROGRAMS OF STUDY			
Cisco Networking (CCNA)	Biotechnology	Multimedia Production	Project Lead the Way (Pre-Engineering)
EXAMPLES OF COLLEGE PROGRAMS OF STUDY			
Networking (CCNP)	Biotechnology	Media Production	Engineering

### THE PATHWAY TO ACHIEVEMENT

Underpinning Career Clusters are the Maryland content standards. These standards reflect the common knowledge and skills students need for each cluster. Content standards include three components: academic, technical, and workplace skills. In Maryland, the workplace skills are known as the Skills for Success. These include learning, thinking, communication, technology, and interpersonal skills. The academic and technical

content standards are used by educators as they design more challenging course sequences for each CTE pathway program.

Improved school and student performance is tied to the Maryland School Assessment Program and the High School Assessments based on Maryland content standards that drive higher expectations. Students progress through a continuum of learning experiences toward their future goals.

## Maryland Career Clusters

*“Students come to college better prepared, more focused and ready to acquire knowledge if they have had the type of applied or experiential learning that imparts the true application of knowledge.”*

Teri Hollander  
Associate Vice Chancellor for Academic Affairs  
University System of Maryland

*“Maryland’s educational institutions must provide rich and diverse opportunities for learning, research, and preparation for initial employment, career advancement, and career changes.”*

Kevin O’Keefe  
Chair  
Maryland Higher Education Commission

*“Maryland’s career clusters offer an excellent framework to promote collaboration between community colleges and high schools to improve students’ transitions from one learning level to the next. The clusters provide a roadmap to the future as graduates continue their education and enter employment. The community colleges of Maryland are committed to helping students achieve their career goals through lifelong learning.”*

Clay Whitlow  
Executive Director  
Maryland Association of Community Colleges

## GUIDE TO MARYLAND’S 10 CAREER CLUSTERS

The section that follows describes in detail each of the 10 Career Clusters and their corresponding Career Pathways. Each description features a diagram of the Career Cluster, which graphically illustrates its specific features, including:

- Career Pathways that represent the major business functions within the industry/Career Cluster;
- Career Cluster knowledge and skills, or a common core of academic, technical, and workplace skills required by professionals in the industry as a whole;
- Career specialties or occupations within each Career pathway; and
- Postsecondary education options that students may pursue to advance in a cluster.

The Maryland State Department of Education is providing leadership and technical assistance in the implementation of the Career Cluster system by:

- Working with business leaders to refine and keep current the content standards;
- Helping educators use Career Clusters to establish smaller learning communities and program articulation;
- Providing a K-16 career development model;
- Identifying best practices and exemplary programs; and
- Monitoring outcomes for student success.

*“Through career clusters and pathways, employers benefit from a well-educated, focused, and critically thoughtful workforce. Our society gains a citizenry whose members are among the best-prepared in the world.”*

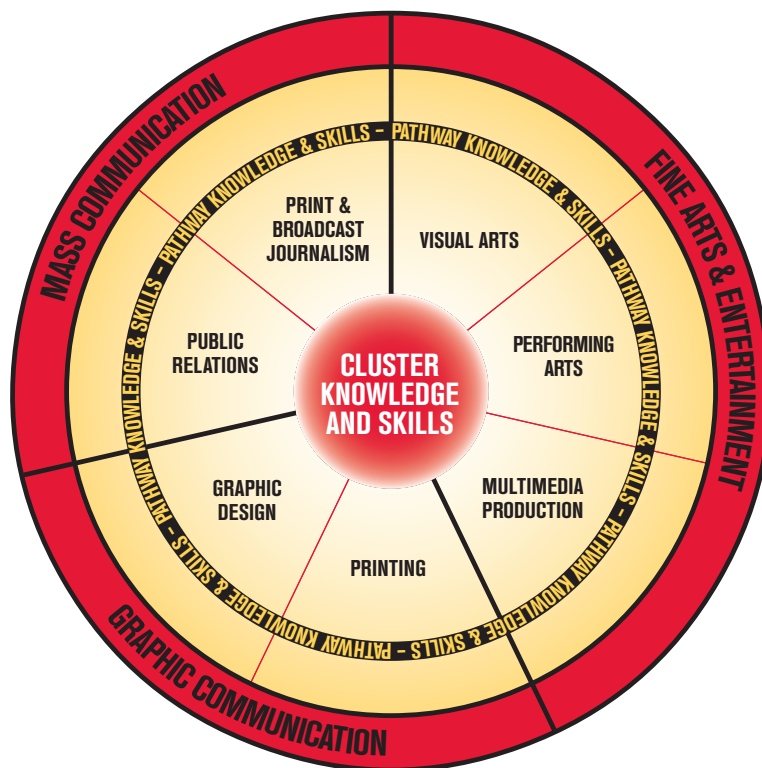
Martha Smith  
President  
Anne Arundel Community College

## Career Cluster 1

### ARTS, MEDIA, AND COMMUNICATION

#### INDUSTRY INSIGHTS

- Expanded global communication and travel are increasing the multicultural content of visual and performing arts and communication products and services, and providing new audiences and markets throughout the United States and the world.
- The growing complexity and rapid pace of modern society and increased global communication and advances in information technology are contributing to an information explosion and expanding markets for mass communication products and services. These products and services include highly specialized journalistic content and coverage; including business, arts and entertainment, global events, and government. These mass communication products and services are being distributed across the full range of mass communication media, including radio, television, and the Internet; and print media, such as newspapers, books, and magazines.
- Advances in information technology are having major impacts on the visual and performing arts, business communication and advertising, and the graphic arts and printing industry. These advances also are driving the growth of multimedia production in traditional areas, such as movies and television; and new areas, such as the gaming industry.



Looking at the industry as a whole, three core areas—Fine Arts and Entertainment, Mass Communication, and Graphic Communication—organize the pathways according to major functions in the industry. Within the core areas, Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate

programs), private career schools, and employee sponsored programs. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.



# Career Cluster 1

## ARTS, MEDIA, AND COMMUNICATION

### CORE AREA 1: FINE ARTS AND ENTERTAINMENT

#### PATHWAY: VISUAL ARTS

Creating, designing, developing, and producing visual arts.

- Create fine arts, design, or photographic art.
- Promote, show, and distribute visual arts through museums, galleries, retail stores, and other distribution channels.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Cartoonist</li> <li>• Fashion Artist</li> <li>• Photographer</li> <li>• Sketch Artist</li> <li>• Craftsperson</li> <li>• Illustrator</li> <li>• Exhibition Installer</li> <li>• Interior Designer</li> </ul>	<ul style="list-style-type: none"> <li>• Textile Designer</li> <li>• Conservator</li> <li>• Museum Director</li> <li>• Fine Artist (i.e., painting, sculpture, ceramics)</li> <li>• Animator</li> <li>• Gallery Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Art Historian</li> <li>• Museum Curator</li> </ul>

#### PATHWAY: PERFORMING ARTS

Creating, designing, developing, producing, and performing in music, theater, and dance, and providing business and technical services.

- Perform as a musician, actor, dancer, and/or singer.
- Promote, manage, and support performers and performances.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Technician (i.e., audio-visual, lighting, sound, stage, props, construction, costume)</li> <li>• Actor</li> <li>• Dancer</li> <li>• Musician</li> <li>• Producer</li> <li>• Assistant Producer</li> <li>• Agent</li> <li>• Playwright</li> <li>• Light, Costume, or Sound Designer</li> </ul>	<ul style="list-style-type: none"> <li>• Production Manager</li> <li>• Director</li> <li>• Theater Manager</li> <li>• Casting Director</li> <li>• Set Designer</li> <li>• Stage Manager</li> <li>• Dance Choreographer</li> </ul>	<ul style="list-style-type: none"> <li>• Composer</li> <li>• Arranger</li> <li>• Conductor</li> <li>• Musician Coach</li> <li>• Artistic Director</li> </ul>

#### PATHWAY: MULTIMEDIA PRODUCTION

Creating and distributing multimedia content focused on audio, film, video, and game production, including simulation.

- Produce multimedia content.
- Market, manage, and distribute multimedia products through radio and television broadcasting and cable, retail stores, the Internet, and a wide variety of devices, including PDAs, computers, and cell phones.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Technicians (i.e., live action segments and motion capture)</li> <li>• Producer (i.e., film, music, radio, recording, television)</li> <li>• Sales Agent</li> <li>• Game Tester</li> <li>• Level Designer</li> </ul>	<ul style="list-style-type: none"> <li>• Programmer</li> <li>• Game Designer</li> <li>• Production Manager</li> <li>• Artist-3D Modeler</li> <li>• Web Designer</li> <li>• Video Designer</li> <li>• Character Animator</li> <li>• Artist</li> <li>• Screenwriter</li> <li>• Editor</li> <li>• Program Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Researcher</li> <li>• Software Engineer-Usability</li> </ul>

# Career Cluster 1

## ARTS, MEDIA, AND COMMUNICATION

### CORE AREA 2: MASS COMMUNICATION

#### PATHWAY: PRINT AND BROADCAST JOURNALISM

Developing, producing, and publishing written, visual, and multimedia journalistic content through mass communication media.

- Write, present, and produce articles, stories, and related journalistic content for radio, television, the Internet, newspapers, books, and magazines.
- Provide business management services and technical support.

#### PATHWAY: PUBLIC RELATIONS

Providing public relations and advertising services and business communications.

- Create public relations communications for all forms of media.
- Manage and support public relations and communications operations.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Software Applications Support Specialist</li> <li>• Electronic Technician</li> <li>• Audio-Visual Equipment Technician</li> <li>• Web Designer</li> </ul>	<ul style="list-style-type: none"> <li>• Journalist</li> <li>• Novelist</li> <li>• Writer</li> <li>• Reporter</li> <li>• Broadcast News Analyst</li> <li>• Radio Announcer</li> <li>• Television Announcer</li> <li>• General Manager</li> <li>• Operations Manager</li> <li>• Advertising Copywriter</li> </ul>	<ul style="list-style-type: none"> <li>• Researcher</li> <li>• Historian</li> <li>• Editor</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Advertising Coordinator</li> <li>• Public Relations Assistant</li> <li>• Community Relations Coordinator</li> <li>• Advertising Layout Designer</li> <li>• Media Buyer</li> </ul>	<ul style="list-style-type: none"> <li>• Speech Writer</li> <li>• Publicist</li> <li>• Public Relations Manager</li> <li>• Communications Manager</li> <li>• Advertising Manager</li> <li>• Writer</li> </ul>	<ul style="list-style-type: none"> <li>• Public Relations Department Manager</li> <li>• Advertising Firm CEO</li> </ul>

### CORE AREA 3: GRAPHIC COMMUNICATION

#### PATHWAY: GRAPHIC DESIGN

Designing and developing digital images.

- Prepare digital images.
- Provide business management and technical support services.

#### PATHWAY: PRINTING

Printing digital images, managing business operations, and providing technical support.

- Conduct press operations.
- Use tools and procedures for quality control.
- Manage business operations, including customer service, sales/accounts, and scheduling, shipping, and distribution.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Graphic Designer</li> <li>• Desktop Publisher</li> <li>• Digital Imaging Specialist</li> </ul>	<ul style="list-style-type: none"> <li>• General Manager</li> <li>• Operations Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Graphic Design Firm CEO</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Pre-Media/Pre-Press Imaging Specialist</li> <li>• Bindery and Finishing Technician</li> <li>• Press Operator</li> <li>• Circulation Agent</li> <li>• Digital Imaging Specialist</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-Media/Pre-Press Manager</li> <li>• General Manager</li> <li>• Operations Manager</li> <li>• Ink Chemist</li> <li>• Paper Scientist</li> <li>• Production Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Computer Systems Engineer</li> <li>• Equipment Design Engineer</li> </ul>

## Career Cluster 1

### ARTS, MEDIA, AND COMMUNICATION

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Information Technology and Communications Support:** Telecommunications, data and computer support services, including communications systems, devices, and equipment, computer software and hardware, and Internet services.
- **Financial Management and Accounting:** Business support services in finance and accounting.
- **Purchasing and Procurement:** Purchasing of materials and equipment for organizations involved in performing and distributing.
- **Legal Services:** Legal services that address all aspects of the business, including purchasing contracts, leases, human resources, and risk management.
- **Public Policy/Government Relations:** Managing government communications, lobbying, and managing relationships with government agencies at the federal, state, and local levels.
- **Human Resources/Training:** Business activities involved in recruitment and hiring of employees, performance reviews, compensation and benefits management, labor relations, and compliance with government laws and regulations; training and development of employees, from orientation to professional and management development.
- **Marketing and Sales:** Market analysis, advertising and promotion, sales, and customer service.
- **Health and Safety/Environmental Management:** Managing and improving health and safety, and maintaining compliance with legal and regulatory requirements, including OSHA, EPA, and CDC.

#### ARTS, MEDIA, AND COMMUNICATION

##### PROGRAM HIGHLIGHT

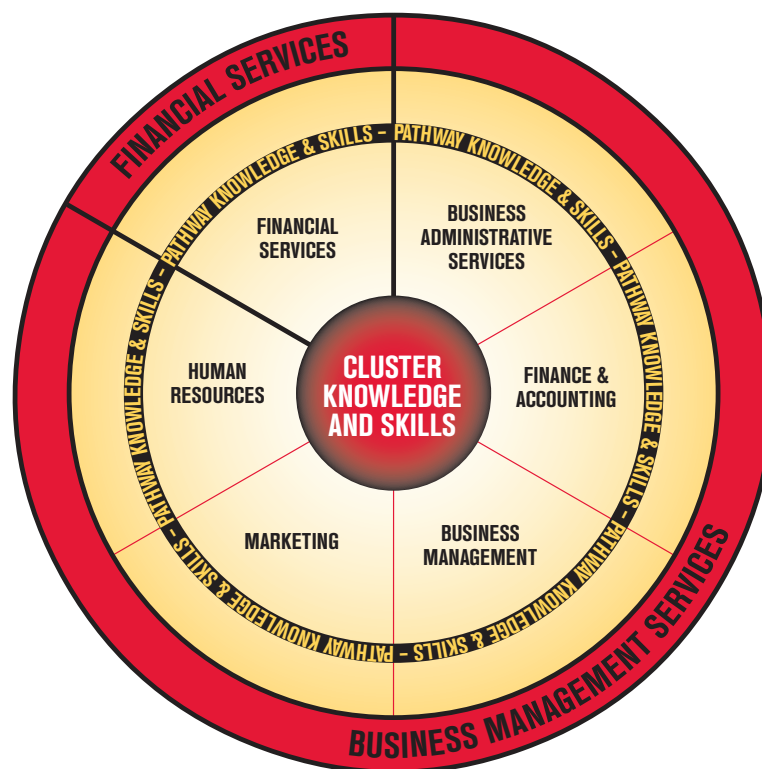
Maryland school systems have achieved national accreditation for their Graphic and Printing Programs and an opportunity for students to achieve national certification through PrintED. PrintED, administered by the Graphic Arts Education and Research Foundation (GAERF®), is a national accreditation program, based on industry standards, for graphic communications courses of study at the secondary and postsecondary levels. Program completers can receive up to nine articulated credits towards an Associate of Arts degree, which further articulates to a Bachelor of Arts degree in graphic design.

## Career Cluster 2

### BUSINESS MANAGEMENT AND FINANCE

#### INDUSTRY INSIGHTS

- The financial services industry sector is becoming increasingly integrated, with many businesses offering a complete range of investment, brokerage, depository, insurance, and lending services. This trend will require financial services professionals to develop, sell, and service a much broader range of financial products and services.
- Businesses are facing an increasingly global, rapidly changing, and competitive environment requiring business management services professionals to have stronger finance, marketing and communication, legal, and management skills. They also will face major challenges in recruiting, hiring, developing, and retaining skilled workers and improving productivity, which will require innovative thinking in human resource management.
- Businesses will continue to expand the use of information technology in all aspects of the business enterprise and will seek more comprehensive e-commerce and information management solutions to remain competitive. This will require all business management professionals to have stronger information technology skills. Information technology professionals will need stronger business skills to better design and manage information technology solutions that meet business needs.



Looking at the industry as a whole, two core areas—Business Management Services and Financial Services—organize the pathways according to major functions in the industry. Within the core areas, Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate programs), private

career schools, and employee sponsored programs. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.

## Career Cluster 2

### BUSINESS MANAGEMENT AND FINANCE

#### CORE AREA 1: BUSINESS MANAGEMENT SERVICES

##### PATHWAY: BUSINESS MANAGEMENT

Managing and supervising activities related to the organization of a business.

- Develop organization's strategic plan.
- Implement plan of work.
- Provide effective and efficient management of business operations.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Management Trainee</li> <li>• Executive Assistant</li> <li>• Supervisor</li> <li>• Small Business Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Branch Manager</li> <li>• Project Manager</li> <li>• Operations Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Chief Executive Officer</li> </ul>

##### PATHWAY: HUMAN RESOURCES

Managing business activities related to employment and operating in compliance with government laws and regulations.

- Recruit and hire employees.
- Evaluate performance.
- Provide compensation and benefits.
- Conduct training and development.
- Manage labor relations.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Payroll Clerk</li> <li>• Human Resources Clerk</li> </ul>	<ul style="list-style-type: none"> <li>• Recruiter</li> <li>• Trainer</li> <li>• Compensation, Benefits, and Job Analyst Specialist</li> <li>• Affirmative Action Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>• Human Resources Manager</li> <li>• Employee or Labor Relations Manager</li> <li>• Employee Assistance Plan Manager</li> <li>• Training and Development Manager</li> <li>• Organizational Developer</li> </ul>

##### PATHWAY: FINANCE AND ACCOUNTING

Managing the financial operations of a business which includes the assets, investments, liabilities, and operating results.

- Manage, audit, and prepare financial and tax reports.
- Evaluate revenue, expenses, and financial requirements, and manage business investments.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Accounting Clerk</li> <li>• Accounts Payable/Receivable Clerk</li> <li>• Bookkeeper</li> <li>• Payroll clerk</li> </ul>	<ul style="list-style-type: none"> <li>• Accountant</li> <li>• Credit Analyst</li> <li>• Investment Banker</li> <li>• Financial Analyst</li> <li>• Budget Analyst</li> <li>• Auditor</li> <li>• Tax Analyst</li> </ul>	<ul style="list-style-type: none"> <li>• Economist</li> <li>• Chief Financial Officer</li> <li>• Treasurer</li> <li>• Comptroller</li> <li>• Finance Director</li> <li>• Certified Public Accountant</li> </ul>



## Career Cluster 2

### BUSINESS MANAGEMENT AND FINANCE

#### PATHWAY: MARKETING

Strategizing business activities related to selling, customer support services, and public relations.

- Analyze customer markets.
- Determine product mix, pricing, promotion, distribution, and public relation strategies.
- Provide customer support services.

#### PATHWAY: BUSINESS ADMINISTRATIVE SERVICES

Providing administrative support throughout organizations.

- Manage information.
- Provide computer applications support.
- Develop and manage report/document production, communication, planning, and organization.
- Coordinate meetings and events.
- Manage the general office.

#### CORE AREA 2: FINANCIAL SERVICES

#### PATHWAY: FINANCIAL SERVICES

Selling, delivering, and supporting investment, brokerage, depository, insurance, and lending services.

- Provide sales and services functions across a broad array of financial products and services.
- Research and develop new financial products and services, including pricing based on changing financial risks and market demand.
- Provide transactional services.
- Evaluate and control risk in providing financial services.
- Manage relationships with major investors.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Sales Representative</li> <li>• Customer Service Representative</li> </ul>	<ul style="list-style-type: none"> <li>• Buyer</li> <li>• Market Research Analyst</li> <li>• Public Relations Specialist</li> <li>• Media Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>• Marketing Manager</li> <li>• Advertising and Promotions Manager</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Office Manager</li> <li>• Administrative Assistant</li> <li>• Secretary</li> <li>• Data Entry Specialist</li> <li>• Computer Support Specialist</li> </ul>	<ul style="list-style-type: none"> <li>• Administrative Services Manager</li> <li>• General Manager</li> <li>• Operations Manager</li> <li>• Executive Assistant</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Securities/Commodities Sales Agent</li> <li>• Brokerage Clerk</li> <li>• Insurance Agent</li> <li>• Bank Teller</li> <li>• Loan Processor</li> <li>• Insurance Policy Processor</li> <li>• Insurance Claims Agent or Investigator</li> <li>• Claims Adjuster</li> <li>• Claims Examiner</li> </ul>	<ul style="list-style-type: none"> <li>• Personal Financial Advisor</li> <li>• Investment Advisor</li> <li>• Financial Analyst</li> <li>• Loan Officer</li> <li>• Bank Operations Manager</li> <li>• Underwriter</li> <li>• Insurance Appraiser</li> <li>• General Manager</li> <li>• Operations Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Economist</li> <li>• Actuary</li> <li>• Statistician</li> <li>• Certified Public Accountant</li> </ul>

## Career Cluster 2

### BUSINESS MANAGEMENT AND FINANCE

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Customer Support:** Providing sales and service support through call centers, help desks, and online services, requiring strong communications and customer service skills similar to customer service representatives.
- **Community Relations:** Managing relationships with local communities, including activities required under community reinvestment laws.
- **Regulatory Compliance:** Operating in compliance with government laws and regulations.
- **Security:** Private and public security services that protect the assets and lives of customers and employees.

#### BUSINESS MANAGEMENT AND FINANCE

##### PROGRAM HIGHLIGHT

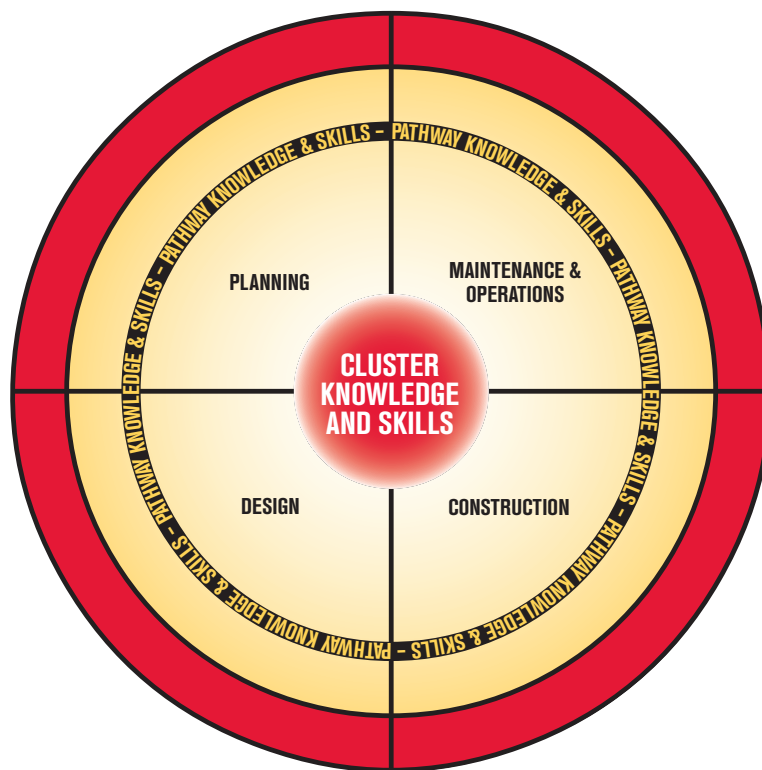
Through a partnership with the National Academy Foundation (NAF), Maryland's National Academy of Finance program features two specialized courses each semester and a college level course in the senior year. The program offers courses such as Financial Services, Economics, Banking and Credit, Securities, International Finance, Financial Planning, and Insurance. Finance Academies introduce students to the broad career opportunities in the financial services industry and equip them to make sound choices for the future.

## Career Cluster 3

# CONSTRUCTION AND DEVELOPMENT

## INDUSTRY INSIGHTS

- Population and economic growth and the transformation of major metropolitan areas will continue to fuel the demand for more residential and commercial building construction and the need to expand and upgrade the public infrastructure, including transportation.
- The construction industry faces a more complex political, social, and economic environment for the planning of residential, commercial, and public infrastructure projects. Construction professionals face challenges in creating plans and designs for major projects that meet more stringent government requirements and gain the support of multiple stakeholders. The construction and development sector also faces new challenges in managing complex construction projects so that projects are completed on time and meet customer requirements for quality and costs.
- Advances in science and technology will continue to drive innovation in the design, construction, and maintenance of buildings and infrastructure, including new design concepts, construction materials and methods, and the application of information technology.



Looking at the industry as a whole, four pathways represent the major functions in the industry. Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate programs), private career schools, and employee sponsored

programs. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.

## Career Cluster 3

### CONSTRUCTION AND DEVELOPMENT

#### PATHWAY: PLANNING

Planning of construction projects, including the market analysis that determines the need for the project and builds public-private support; environmental impact; and the financial analysis that determines costs and financing requirements.

- Develop concept, feasibility analysis, and master plan.
- Manage business and marketing aspects.

#### PATHWAY: DESIGN

Designing and engineering physical structures from original concept to complete architectural and engineering plans for the development of land sites and the physical structures built on sites.

- Develop budget.
- Program all elements of project.
- Develop concepts/schematics and construction documents.
- Determine construction support.
- Manage business and marketing aspects.

#### PATHWAY: CONSTRUCTION

Conducting the bidding and award process and actual construction of physical structures, including land development, general contracting, and special trades contracting activities.

- Procure labor, materials, and subcontractors.
- Construct site.
- Conduct inspection, closeout/acceptance, and warranty processes.
- Manage business and marketing aspects.

#### PATHWAY: MAINTENANCE AND OPERATIONS

Managing, operating, and maintaining/repairing existing physical structures.

- Provide warranty and repair services.
- Maintain landscape.
- Manage business and marketing aspects.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Construction Manager</li> <li>• Civil Engineering Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Architect</li> <li>• Financial Analyst</li> <li>• Environmental Engineer</li> <li>• Civil Engineer</li> <li>• Land Surveyor</li> </ul>	<ul style="list-style-type: none"> <li>• Urban and Regional Planner</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Construction Manager</li> <li>• Drafter/CAD Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Engineers (all types)</li> <li>• Architect</li> <li>• Specifications Writer</li> <li>• Environmental Scientist</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Construction Manager</li> <li>• Drafter/CAD Technician</li> <li>• Building Code Inspector</li> <li>• Plumber</li> <li>• Carpenter</li> <li>• Electrician</li> </ul>	<ul style="list-style-type: none"> <li>• Engineers (all types)</li> <li>• Project Manager</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Real Estate Manager</li> <li>• Facility Manager</li> <li>• Construction Occupations (all trades )</li> <li>• Heating, Ventilation, Air Conditioning, Refrigeration Technician</li> <li>• Engineering Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Engineers (all types)</li> <li>• Project Manager</li> <li>• Cost Estimator</li> </ul>

## Career Cluster 3

### CONSTRUCTION AND DEVELOPMENT

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Code Review:** Public and private activities involved in ensuring that construction projects are in compliance with government regulations and building codes.
- **Equipment Maintenance:** Maintaining the reliability and performance of construction equipment including preventive maintenance and repair.
- **Quality Assurance:** Business activities that ensure construction projects are using processes for buildings and physical structures to meet quality standards.
- **Information Technology:** Business services that provide telecommunications, data and computer support services, and overall e-commerce support to the core business functions.
- **Human Resources:** Recruitment and hiring of employees, performance reviews, compensation and benefits management, labor relations, and compliance with government laws and regulations.
- **Training:** Training and development of construction employees ranging from orientation and safety training to apprenticeship training for specific trades.
- **Marketing:** Promotion and selling of construction projects and the overall business to targeted markets.
- **Risk Management:** Prevention and management of financial losses due to a range of causes, including accidents and injuries, theft, and environmental impacts.
- **Environmental Management:** Management and reduction of risks associated with environmental impacts and ensure compliance with government laws and regulations.
- **Safety:** Management and reduction of risks associated with health and safety, and compliance with government laws and regulations.
- **Legal:** Legal services that address all aspects of the business, including contracts, human resources, and risk management.
- **Finance:** Financial services that address the financing needs of construction projects and the overall business.
- **Accounting:** Accounting services that manage the revenues and costs of construction projects and the overall business.
- **Apprenticeship:** Apprenticeship programs that prepare workers for construction trades.
- **Labor Union Management:** Business, operational, and political activities involved in the operation and management of labor unions, including activities carried out by political directors and legislative relations.

#### CONSTRUCTION AND DEVELOPMENT

Construction and Development programs offer opportunities for students to pursue interests in developing, designing, constructing, and maintaining the built environment. Students in the Construction Pathway learn basic design as well as plumbing, electrical, and carpentry skills as they earn advanced standing in apprenticeship programs or college credit in postsecondary construction programs. Many schools provide students the opportunity to construct a house under the guidance of professional mentors. Students learn first-hand all aspects of the construction process from design to finish.

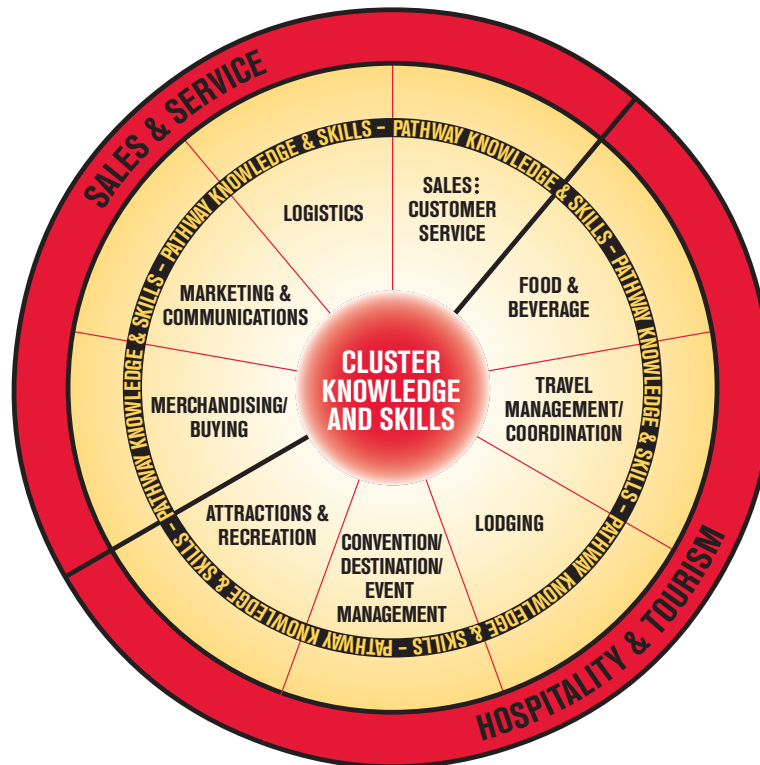


## Career Cluster 4

### CONSUMER SERVICES, HOSPITALITY, AND TOURISM

#### INDUSTRY INSIGHTS

- Global trade, travel, technological advances, and growing consumer income continue to expand the consumer services sector, including the range of products and services and the growth of a wide variety of retail businesses and Internet sales.
- Increased competition will continue to force wholesale and retail businesses to find new ways to provide high levels of customer service at lower costs. Advances in logistics, inventory management, and information technology are leading to major innovations for responding to customer needs and controlling inventory costs.
- Expanded global leisure and business travel and growing consumer spending on leisure and tourism activities continue to drive the growth of the hospitality and tourism sector. States and local communities will increase the promotion of destination events and tourism to attract outside spending and economic development. These trends are also promoting innovations and cultural diversification in the restaurant industry with an expanded spectrum of cuisines and services provided to customers.



Looking at the industry as a whole, two core areas—Sales and Service and Hospitality and Tourism—organize the pathways according to major functions in the industry. Within the core areas, Career Pathways show more specific business activities that offer a range of related career opportunities. A range of educational options can prepare someone for a career in this

industry. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.

## Career Cluster 4

### CONSUMER SERVICES, HOSPITALITY, AND TOURISM

#### CORE AREA 1: SALES AND SERVICE

##### PATHWAY: MERCHANDISING/BUYING

Providing products and services for sale to customers.

- Analyze, plan, purchase, price, and allocate products and services.
- Conduct purchasing negotiations.
- Manage supplier/vendor relationships.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Assistant Buyer</li> <li>• Buying Clerk</li> <li>• Visual Display Designer</li> </ul>	<ul style="list-style-type: none"> <li>• General Merchandise Manager</li> <li>• Divisional Merchandise Manager</li> <li>• Merchandise Manager</li> <li>• Category Manager</li> <li>• Buyer</li> </ul>

##### PATHWAY: MARKETING AND COMMUNICATIONS

Determining customer needs and product preferences, positioning product/service mix in the market, and communicating to and educating the customer to retain interest.

- Conduct market research to determine customer needs and product preferences.
- Develop major messages.
- Provide creative services for advertising and promotion.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Visual Display Designer</li> <li>• Advertising Coordinator</li> <li>• Public Relations Assistant</li> <li>• Community Relations Coordinator</li> <li>• Advertising Layout Designer</li> <li>• Media Buyer</li> </ul>	<ul style="list-style-type: none"> <li>• Marketing Director</li> <li>• Marketing Manager</li> <li>• Marketing Analyst</li> <li>• Creative Services/Advertising Manager</li> </ul>

##### PATHWAY: LOGISTICS

Planning and managing the distribution of products and services to the point of sale, and the post-sale delivery of products and services to the customer.

- Sort and organize merchandise at warehouses and distribution centers, and transport.
- Process returned or damaged merchandise.
- Manage inventory.
- Prepare merchandise for sale, including marking.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Warehouse Manager/ Supervisor/Team Leader</li> <li>• Security/Loss Prevention Specialist</li> <li>• Inventory/Quality Control Specialist</li> <li>• Inventory System Specialist</li> </ul>	<ul style="list-style-type: none"> <li>• Division/District Manager</li> <li>• Department Manager</li> <li>• Traffic Manager</li> <li>• Industrial Engineer</li> <li>• Transportation Planner/ Analyst</li> <li>• Logistics Manager</li> </ul>

## Career Cluster 4

### CONSUMER SERVICES, HOSPITALITY, AND TOURISM

#### PATHWAY: SALES: CUSTOMER SERVICE

Managing the sales process and overall consumer relationship, including assessing customer need and providing ongoing support before and after sales of products and services.

SAMPLE CAREER OPTIONS	
WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Department Manager</li> <li>• Branch Manager</li> <li>• Sales Manager/Agent/Associate</li> <li>• Account Representative</li> <li>• Real Estate Agent</li> <li>• Cosmetologist</li> <li>• Sales Manager</li> <li>• Sales Associate</li> <li>• Salon Manager</li> </ul>	<ul style="list-style-type: none"> <li>• General/Regional Manager</li> <li>• Branch Manager</li> <li>• Territory Manager</li> </ul>

#### CORE AREA 2: HOSPITALITY AND TOURISM

#### PATHWAY: FOOD AND BEVERAGE

Making, selling, and serving food and beverages to the public for a fee, including services by restaurants, caterers, institutional food providers, and other recreational and entertainment venues.

SAMPLE CAREER OPTIONS	
WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Restaurant Owner</li> <li>• Sales Manager</li> <li>• Host/Hostess</li> <li>• Chef</li> <li>• Kitchen Manager</li> <li>• Maitre d'</li> </ul>	<ul style="list-style-type: none"> <li>• General Manager</li> <li>• Food Service Manager</li> <li>• Executive Chef</li> <li>• Menu Planner</li> <li>• Nutritionist</li> <li>• Registered Dietitian</li> </ul>

#### PATHWAY: LODGING

Providing sleeping space to guests for a fee in facilities such as hotels, bed and breakfasts, hostels, campgrounds, resorts, and cruise ships.

- Market and sell lodging services.
- Maintain and operate facilities.

SAMPLE CAREER OPTIONS	
WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Housekeeping Director</li> <li>• Reservations Manager</li> <li>• Front Office Manager</li> <li>• PBX/Reservations Agent</li> <li>• Front Desk Clerk</li> <li>• Concierge</li> <li>• Bell Captain</li> <li>• Chief Engineer</li> <li>• Network Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Lodging Owner/Franchisee</li> <li>• General Manager</li> <li>• Engineering Director</li> <li>• Sales Director</li> <li>• Marketing Director</li> <li>• Rooms Director</li> <li>• Activities Director</li> </ul>

## Career Cluster 4

### CONSUMER SERVICES, HOSPITALITY, AND TOURISM

#### PATHWAY: ATTRACTIONS AND RECREATION

Providing recreation, amusement, and leisure services to visitors at recreational, historic, amusement, heritage, and cultural sites, including museums, parks and zoos, marinas, campgrounds, and recreational vehicle parks.

- Market and sell recreational services and activities in resorts and on cruise ships, at specialized retail centers, and at facilities for skiing, sailing, golf, and other outdoor recreational sports.

#### PATHWAY: CONVENTION/DESTINATION/ EVENT MANAGEMENT

Planning, organizing, and implementing special events for the public, such as festivals, fairs, sporting events, exhibitions, conventions, and convocations.

#### PATHWAY: TRAVEL MANAGEMENT/ COORDINATION

Planning, organizing, and facilitating travel from one location to another for leisure or business away from home.

- Market, promote, coordinate, and sell travel services.
- Provide transportation services.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Business Owner</li> <li>• Theme Park Manager</li> <li>• Program Manager/Director</li> <li>• Recreation Instructor</li> <li>• Interpreter</li> <li>• Promotion Manager</li> <li>• Corporate/Community Development Coordinator</li> </ul>	<ul style="list-style-type: none"> <li>• General Manager</li> <li>• Property Manager</li> <li>• Theme Park Manager</li> <li>• Park Ranger</li> <li>• Park and Recreation Director</li> <li>• Cruise Ship Director</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Group Sales Agent</li> <li>• Product Development Specialist</li> <li>• Destination Manager</li> <li>• Activities Director</li> <li>• Tourism Specialist</li> <li>• Facility Manager</li> <li>• Security Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Market Researcher</li> <li>• Events Planner/Manager</li> <li>• Account Executive</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Sales/Marketing Manager</li> <li>• Contract Manager</li> <li>• Travel Agency Manager</li> <li>• Tour Broker</li> <li>• Travel Agent</li> </ul>	<ul style="list-style-type: none"> <li>• General Manager</li> </ul>

## Career Cluster 4

### CONSUMER SERVICES, HOSPITALITY, AND TOURISM

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Information Technology and Communications Support:** Telecommunications, data, and computer support services to the core business functions of the sales and service industry, including point of sale and security electronics, communications systems and devices, film and audio-visual services and equipment, computer software and hardware, and Internet services.
- **Financial Management:** Business support services in finance and accounting.
- **Legal Services:** Legal services that address all aspects of the business, including purchasing contracts, leases, human resources, and risk management.
- **Government Relations:** Managing government communications, lobbying, and managing relationships with government agencies at the federal, state, and local levels.
- **Human Resources/Training:** Business activities involved in recruiting and hiring employees, conducting performance reviews, managing compensation and benefits, handling labor relations, and complying with government laws and regulations; training and developing of employees, ranging from orientation to professional and management development.
- **Risk Management:** Business support services to provide health, safety, and environmental protection and insurance for employees and customers; loss prevention for merchandise and facilities; compliance with government laws and regulations; security.
- **Maintenance/Facility Support:** Maintaining physical facilities, from architecture, design services, facility, and equipment maintenance services, to building cleaning services, landscape and grounds planning, and maintenance.

#### CONSUMER SERVICES, HOSPITALITY, AND TOURISM

##### PROGRAM HIGHLIGHT

Through a partnership with the National Academy Foundation (NAF), Maryland's Academy of Hospitality and Tourism offers an in-depth look at all aspects of travel, tourism, and hospitality, including coursework in geography, economics, and systems applications. Two specialized courses are featured each semester and a college-level course is offered in the senior year. The program equips students with the personal, analytical, technical, and communication skills they need to succeed.

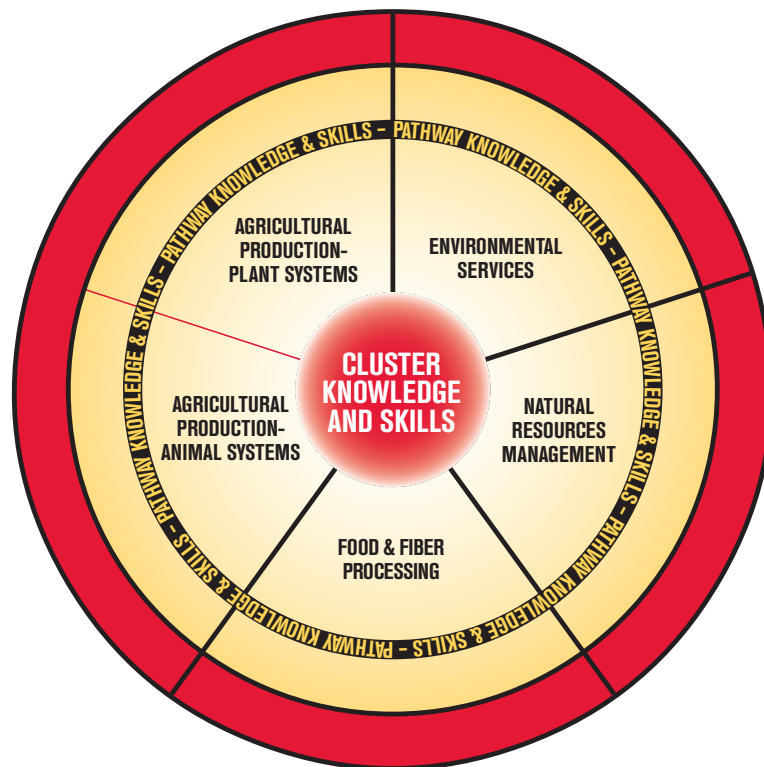


## Career Cluster 5

# ENVIRONMENTAL, AGRICULTURAL, AND NATURAL RESOURCE SYSTEMS

## INDUSTRY INSIGHTS

- The agricultural sector is a highly competitive global industry creating new challenges in identifying global and domestic markets; improving business planning, financing, risk management, and productivity; and reducing costs. This sector also will continue to face more stringent requirements for food quality and environmental and natural resource management.
- Advances in science and technology, in particular biotechnology, will continue to drive innovation and growth in agricultural production and food processing through the development of new markets, products, and processes. In addition, advances in information technology will continue to improve the planning and management of agricultural production.
- 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. There will be increased public and private efforts to improve the management of both public and private natural resources, including water, air, and land quality, and waste management. Advances in science, biotechnology, and information technology will drive major innovations in environmental and natural resources management.



Looking at this industry as a whole, five pathways represent the major functions in the industry. Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate programs), private career schools, and employee sponsored

programs. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.

## Career Cluster 5

# ENVIRONMENTAL, AGRICULTURAL, AND NATURAL RESOURCE SYSTEMS

### PATHWAY: AGRICULTURAL PRODUCTION – PLANT SYSTEMS

Planning, producing, and distributing plant food, fiber, ornamental, and environmental products, including landscaping and horticultural services; related research and technical services, and business planning and finance.

- Conduct market and location analysis, soil testing, and product testing/selection.
- Plan, manage, and control materials purchasing, land preparation, production, product quality control, inventory, and biosecurity.
- Manage health, safety, and environmental practices.
- Conduct research for new markets, products and processes (genetic research).
- Develop and test advanced applications of biotechnology.
- Plan for risk management.
- Manage health, safety, and environmental practices.

### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Field Production or Farm Manager</li> <li>• Compliance Manager</li> <li>• Arborist</li> <li>• Landscaper</li> <li>• Florist</li> <li>• Certified Professional Horticulturalist (CPH)</li> <li>• Nursery/Garden Center Manager</li> <li>• Greenhouse Assistant</li> </ul>	<ul style="list-style-type: none"> <li>• Soil Scientist</li> <li>• Geographic Information Systems Specialist</li> <li>• Nutrient Management Specialist</li> <li>• IPM/Pest Control Specialist</li> <li>• Soil Conservation Planner</li> <li>• Landscape Designer</li> <li>• Landscape Architect</li> </ul>	<ul style="list-style-type: none"> <li>• Plant Scientist</li> <li>• Research Project Manager</li> <li>• Geneticist</li> <li>• Patent Lawyer</li> <li>• Entomologist</li> <li>• Plant Pathologist</li> <li>• Tissue Culture Specialist</li> <li>• Plant Breeder</li> <li>• Extension Educator/Specialist</li> </ul>

### PATHWAY: AGRICULTURAL PRODUCTION – ANIMAL SYSTEMS

Planning, producing and distributing meat, poultry, seafood and dairy products; raising livestock, aquaculture, veterinary services, related research and technical services; business planning and finance.

- Conduct market and location analysis, soil testing, and product testing/selection.
- Plan, manage and control materials purchasing, production, product quality control, inventory, and biosecurity.
- Conduct research for new markets, products, and processes (genetic research).
- Develop and test advanced applications of biotechnology.
- Plan for risk management.
- Manage health, safety, and environmental practices.

### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Animal Production Manager</li> <li>• Horse Trainer</li> <li>• Environmental Technician</li> <li>• Veterinary Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Geographic Information Systems Specialist</li> <li>• Nutritionist</li> <li>• Inspector</li> <li>• Soil Conservation Planner</li> </ul>	<ul style="list-style-type: none"> <li>• Veterinarian</li> <li>• Geneticist</li> <li>• Product Developer</li> <li>• Production Quality Assurance Manager</li> <li>• Research Scientist</li> <li>• State Health Official</li> </ul>

## Career Cluster 5

# ENVIRONMENTAL, AGRICULTURAL, AND NATURAL RESOURCE SYSTEMS

### PATHWAY: FOOD AND FIBER PROCESSING

Researching and developing products focused on nutritional value; processing and packaging plant and animal products.

- Convert harvested plant and animal materials into end-use products.
- Plan and manage production, including process engineering, quality assurance and food safety, health, worker safety, environmental compliance, and industrial maintenance.

### PATHWAY: NATURAL RESOURCES MANAGEMENT

Managing, conserving, and restoring natural resources, such as parks, fisheries, forestry, wildlife and habitat, watersheds and tributaries; and the environmental monitoring of power plants.

- Plan and manage public and private natural resources and inventory.
- Conduct scientific testing, monitoring, and research.
- Develop and maintain natural resource areas, including civil engineering and construction.
- Improve the education and awareness of users about natural resources.

### PATHWAY: ENVIRONMENTAL SERVICES

Planning, testing, monitoring, maintaining, and restoring water, air, and land quality and waste management for the protection of public health and environmental quality.

- Provide scientific research, safety, and technical support services, including geological measurement and geographic information systems; law enforcement; and compliance monitoring and permitting.
- Communicate to and educate the public on maintaining environmental quality and respond to environmental and public health emergencies.
- Manage all types of water resources.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Buyer</li> <li>• Inspector</li> <li>• Logistics and Inventory Manager</li> <li>• Meat Grader</li> <li>• Production Supervisor</li> <li>• Laboratory Technician</li> <li>• Quality Assurance Associate</li> </ul>	<ul style="list-style-type: none"> <li>• New Product Scientist</li> <li>• International Marketing and Packaging Manager</li> <li>• Nutrition Scientist</li> <li>• Food Scientist</li> </ul>	<ul style="list-style-type: none"> <li>• Information Systems Manager</li> <li>• Industrial Engineer</li> <li>• Quality Assurance Manager</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Natural Resources Police Officer</li> <li>• Forestry Technician</li> <li>• Naturalist</li> <li>• Fishery Technician</li> <li>• Hatchery Technician</li> <li>• Wildlife Technician</li> <li>• Geographic Information Systems Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Policy Analyst</li> <li>• Forester</li> <li>• Fisheries Manager</li> <li>• Soil Conservation Planner</li> <li>• Park Manager</li> <li>• Wildlife Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Biologist</li> <li>• Physical Scientist</li> <li>• Fisheries Scientist</li> <li>• Environmental Engineer</li> <li>• Ecological Engineer</li> <li>• Wildlife Biologist</li> <li>• Forest Scientist</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Hazardous Materials Specialist</li> <li>• Lead/Abatement Technician</li> <li>• Environmental Technician</li> <li>• Emergency Response Technician</li> <li>• Geographic Information Systems Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Planner</li> <li>• Geologist</li> <li>• Water Resource Engineer</li> <li>• Environmental Compliance Specialist</li> <li>• Health Physicist</li> <li>• Public Health Engineer</li> <li>• Air Quality Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Water Quality Manager</li> <li>• Toxicologist</li> <li>• Land Use/Environmental Engineer</li> <li>• Industrial Hygienist</li> <li>• Environmental Lawyer</li> </ul>

## Career Cluster 5

### ENVIRONMENTAL, AGRICULTURAL, AND NATURAL RESOURCE SYSTEMS

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Information Technology and Communications Support:** Telecommunications, data, and computer support services, including communications systems and devices, film and audio-visual services and equipment, computer software and hardware, and Internet services.
- **Financial and Business Services:** Financial, sales, and distribution services to producers of agricultural products, including capital and land acquisition, banking, financial management and insurance, sales and product support, customer inventory, management, and storage.
- **Agricultural and Environmental Engineering:** Maintaining and supporting technological systems used to produce, store, and distribute agricultural and natural resource products, including production and production control equipment, structural facilities, and irrigation equipment.
- **Strategic Planning:** Long-range business planning to set the overall direction of the business and respond to projected changes in environmental conditions.
- **Legal Services:** Legal services that address all aspects of the organization, including purchasing contracts, leases, human resources, and risk management.
- **Government Relations/Legislative Affairs:** Managing government communications, lobbying, and managing relationships with government agencies at the federal, state, and local levels.
- **Human Resources/Training:** Business activities involved in recruiting and hiring employees, conducting performance reviews, compensation and benefits management, labor relations, and compliance with government laws and regulations, training and development of employees ranging from orientation to professional and management development.
- **International Marketing and Distribution:** International market analysis and management of product exporting.
- **Transportation Services:** Transporting agricultural and natural resource products by water, rail, land, and air.
- **University Research, Teaching, and Outreach:** Technical and educational services provided by universities to support agriculture and natural resource management.

#### PROGRAM HIGHLIGHT

#### ENVIRONMENTAL, AGRICULTURAL, AND NATURAL RESOURCE SYSTEMS

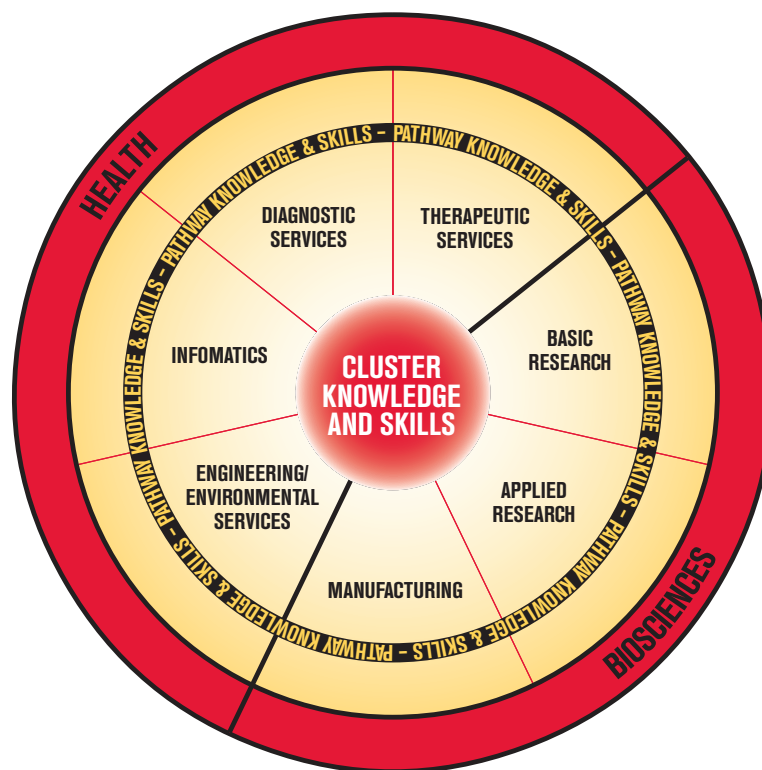
Agricultural programs give students the opportunity to incorporate and apply what they have learned in their academic disciplines while preparing them to enter Maryland's largest industry. Specific courses range from traditional production management and agricultural mechanics to biotechnology, veterinary science, and aquaculture. Programs offer students hands-on learning experience through use of specialized equipment and participation in supervised projects outside of the classroom.

## Career Cluster 6

### HEALTH AND BIOSCIENCES

#### INDUSTRY INSIGHTS

- The aging of the American population, advances in medical knowledge and technology, and growing public awareness of health issues are contributing to a growing demand for high-quality healthcare services.
- The healthcare industry will continue to shift the focus to prevention, the promotion of wellness, and the improvement of the health status of patients and communities over time. The healthcare industry also will continue to face strong cost containment and competitive pressures and will seek new ways to improve patient satisfaction and health. The industry will continue to move the delivery of healthcare services from hospitals and residential care facilities to ambulatory or outpatient care facilities and home-based care.
- Advances in bioscience, information technology, and biomedical technology will drive continuous innovation in patient care. Healthcare professionals will need stronger science, mathematics and information technology skills. Stronger relations between healthcare and bioscience industries in developing, testing, and implementing new products and services will be required.
- Advances in bioscience will continue to drive major innovations and create new business opportunities across most major industries, including agriculture, natural resource management, environmental services, forensics services, manufacturing, and healthcare.



Looking at this industry as a whole, two core areas—Health and Biosciences—organize the pathways according to major functions in the industry. Within the core areas, Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate

programs), private career schools, and employee sponsored programs. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.

## Career Cluster 6

### HEALTH AND BIOSCIENCES

#### CORE AREA 1: HEALTH

##### PATHWAY: THERAPEUTIC SERVICES

Promoting wellness and improving the health statistics of patients and communities over time.

- Use technology to provide physical, mental health, and social services to improve health status.
- Collect data, create treatment plans, implement procedures, and evaluate client status.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Registered Nurse</li> <li>• Licensed Practical Nurse</li> <li>• Nurse Assistant</li> <li>• Respiratory Care Therapist</li> <li>• Radiographer</li> <li>• Medical Lab Technician</li> <li>• Medical Assistant</li> <li>• Pharmacy Technician</li> <li>• Surgical Technologist</li> <li>• Dietetic Technician</li> <li>• Dental Assistant</li> <li>• Dental Hygienist</li> <li>• Dental Lab Technician</li> <li>• Massage Therapist</li> <li>• Physical Therapy Assistant</li> <li>• Occupational Therapy Assistant</li> </ul>	<ul style="list-style-type: none"> <li>• Physician Assistant</li> <li>• Dietician/Nutritionist</li> <li>• Occupational Therapist</li> <li>• Medical Technologist</li> <li>• Nurse Supervisor</li> <li>• Chiropractor</li> <li>• Registered Nurse</li> <li>• Nurse Educator</li> </ul>	<ul style="list-style-type: none"> <li>• Physician</li> <li>• Nurse Practitioner</li> <li>• Dentist</li> <li>• Ophthalmologist</li> <li>• Psychologist</li> <li>• Pharmacist</li> <li>• Physical Therapist</li> <li>• Genetic Counselor</li> <li>• Audiologist</li> <li>• Speech and Language Pathologist</li> <li>• Nurse Director</li> </ul>

##### PATHWAY: DIAGNOSTIC SERVICES

Collecting images or data on the health status of the client at a single point of time.

- Plan and conduct diagnostic procedures.
- Evaluate, interpret, and document results.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Medical Laboratory Technician</li> <li>• Phlebotomist</li> <li>• Radiographer</li> <li>• Cardiovascular Technician</li> <li>• Registered Nurse</li> <li>• EKG Technician</li> <li>• EEG Technician</li> <li>• Radiation/Oncology Therapist</li> </ul>	<ul style="list-style-type: none"> <li>• Occupational Therapist</li> <li>• Medical Technologist</li> </ul>	<ul style="list-style-type: none"> <li>• Physician</li> <li>• Psychologist</li> <li>• Nurse Practitioner</li> <li>• Physical Therapist</li> <li>• Speech and Language Pathologist</li> </ul>



## Career Cluster 6

### HEALTH AND BIOSCIENCES

#### PATHWAY: INFOMATICS

Documenting client care.

- Determine information requirements and information analysis.
- Determine abstracting and coding, information systems, and documentation.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Medical Records Administrator</li> <li>• Medical Records/ Health Information Technician</li> <li>• Administrative Medical Assistant</li> <li>• Medical Office Assistant</li> <li>• Health Information Technician</li> <li>• Billing and coding professional</li> <li>• Health Information Coder</li> </ul>	<ul style="list-style-type: none"> <li>• Health Insurance Manager</li> <li>• Utilization Manager</li> <li>• Corporate Compliance Officer</li> <li>• Health Information Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Medical Librarian</li> </ul>

#### PATHWAY: ENGINEERING/ ENVIRONMENTAL SERVICES

Providing direct or indirect client care and creating a therapeutic environment for providing that care.

- Implement aseptic procedures, aesthetics, and resource management.
- Maintain and support biomedical technology and the physical facility.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Biomedical Equipment Technician</li> <li>• Transport Technician</li> <li>• Materials Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Safety Manager/ Engineer</li> <li>• Biomedical Engineer</li> </ul>

### CORE AREA 2: BIOSCIENCES

#### PATHWAY: BASIC RESEARCH

Participating in scientific exploration with direct or indirect applications to the improvement of the quality of life.

- Generate large-scale and small-scale data, and analyze.
- Conduct strategic planning and forecasting.
- Prepare documentation, publication, and budget.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Documentation Specialist</li> <li>• Research Assistant</li> <li>• Production Technician</li> <li>• Materials Management Specialist</li> <li>• Quality Control Specialist</li> <li>• Animal Technician</li> <li>• Biotechnology Laboratory Assistant</li> <li>• Bench Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory Affairs Associate</li> <li>• Laboratory Technician</li> <li>• Research Technician</li> <li>• Technical Writer</li> <li>• Biochemist</li> <li>• Chemical Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory Affairs Officer</li> <li>• Quality Control/ Assurance Director</li> <li>• Bioinformatics Analyst/Engineer</li> <li>• Bioethicist</li> <li>• Research Scientist</li> <li>• Medical Review Officer</li> </ul>

## Career Cluster 6

### HEALTH AND BIOSCIENCES

#### PATHWAY: APPLIED RESEARCH

Testing and evaluating new products and services in laboratory and field environments and developing systems for producing products for large-scale use.

- Conduct legal reviews.
- Determine safety and efficacy of new products.
- Develop testing designs.
- Develop and acquire limited quantities of products and related materials for conducting tests.
- Conduct tests and field trials and analyze and present results.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Research Assistant</li> <li>• Quality Control Specialist</li> <li>• Validation Engineer</li> <li>• Process Engineer</li> <li>• Compliance Training Specialist</li> <li>• Production Technician</li> <li>• Bench Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory Affairs Associate</li> <li>• Laboratory Technician</li> <li>• Research Technician</li> <li>• Technical Writer</li> <li>• Chemist</li> <li>• Biomedical Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• Medical Review Officer</li> <li>• Clinical Trials Manager</li> <li>• Manufacturing Director</li> <li>• Biostatistician</li> <li>• Medical Director</li> <li>• Quality Control/Assurance Director</li> </ul>

#### PATHWAY: MANUFACTURING

Producing bioscience products, such as vaccines and laboratory materials, on a commercial scale.

- Implement, manage, operate, and maintain production systems.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Manufacturing Technician</li> <li>• Validation Engineer</li> <li>• Technical Training Specialist</li> <li>• Production Planner</li> <li>• Clean Room Specialist</li> <li>• Media Technician</li> <li>• Bench Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Operations Manager</li> <li>• Quality Manager/Technician</li> <li>• Manufacturing/Chemical Engineer</li> <li>• Analytical Chemist</li> <li>• Microbiologist</li> <li>• Industrial Production Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Medical Director</li> <li>• Senior Methodologist</li> <li>• Senior Scientist</li> <li>• Medical Science Liaison</li> <li>• Regulatory Affairs Officer</li> <li>• Manufacturing Director</li> </ul>

## Career Cluster 6

### HEALTH AND BIOSCIENCES

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Information Technology and Communications Support:** Telecommunications, data, and computer support services to core business functions of sales and service and of the research and manufacturing industries, including communications systems and devices, film and audio-visual services and equipment, computer software and hardware, and Internet services.
- **Business Management/Managed Care:** Managing healthcare finances associated with insurance and managed care organizations.
- **Financial Management and Accounting:** Business support services in finance and accounting.
- **Legal Services:** Legal services that address all aspects of the business, including purchasing contracts, leases, human resources, and risk management.
- **Public Policy/Government Relations:** Managing government communications and lobbying and managing relationships with government agencies at the federal, state, and local levels.
- **Human Resources/Training:** Business activities involved in recruitment and hiring of employees, performance reviews, compensation and benefits management, labor relations, and compliance with government laws and regulations. It also refers to the training and development of employees, ranging from orientation to professional and management development.
- **Risk Management:** Business support services providing health, safety, and environmental protection and insurance for employees and customers; loss prevention for both merchandise and facilities; compliance with government laws and regulations; and security.
- **Maintenance/Facility Support:** Maintaining physical facilities, including architecture and design services, facility and equipment maintenance services, building cleaning services, landscape and grounds planning, and maintenance.
- **Marketing and Sales:** Market analysis, advertising and promotion, sales, and customer service.
- **Accreditation:** Attaining and maintaining organizational accreditation.
- **Health and Safety/Environmental Management:** Managing and improving health and safety and maintaining compliance with legal and regulatory requirements, including OSHA, EPA, MOSH, and CDC.

#### HEALTH AND BIOSCIENCES

##### PROGRAM HIGHLIGHT

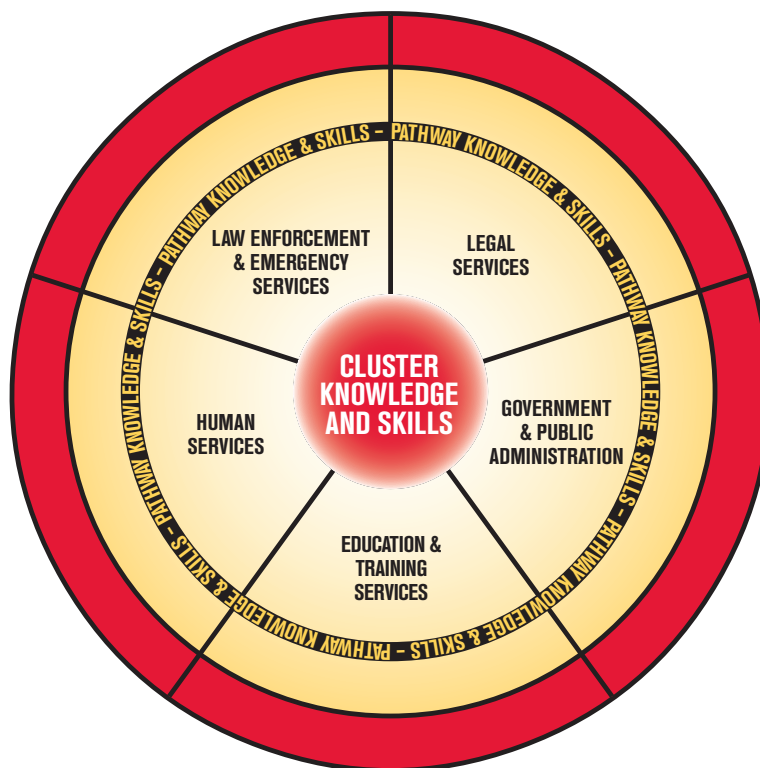
Medical careers programs offer secondary students the opportunity to develop knowledge and skills in diagnostic and therapeutic services, patient care, and health support services. These programs often allow students to earn an industry-recognized certification to document their skill level and advance their career options. Completers of medical careers programs are academically prepared to enter a postsecondary healthcare program of study.

## Career Cluster 7

### HUMAN RESOURCE SERVICES

#### INDUSTRY INSIGHTS

- The aging and growing diversity of the American population, advances in scientific knowledge, and increased public awareness of social problems and issues are contributing to a demand for more skilled social service workers and high-quality social services, including early childhood development; mental health/addiction; individual, family, and community; and workplace/workforce support. The emphasis in all these areas will shift to prevention and community-based services.
- Public concerns over crime, security, and emergency response and the increased demand for legal intervention in business and communities will continue to drive the growth of legal and court services. Advances in information technology and science will drive major innovations in law enforcement, emergency services, and legal services, including forensics, digital imaging, and global positioning systems.
- The evolving global economy will require all workers to have advanced education and continual upgrading of their skills. This need will fuel the growth of the education and training industry in both the public and private sectors, including K-12/postsecondary education, businesses, and businesses that provide training and development services to businesses.
- The demand of this new global economy and social and technological changes in the face of mounting pressures to control costs will lead to the reinvention of government services at the federal, state, and local levels. In particular, advances in information technology will transform how government agencies carry out their critical roles and functions.



Looking at this industry as a whole, five pathways represent the major functions in the industry. Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate programs), private career schools, and employee sponsored

programs. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.

## Career Cluster 7

### HUMAN RESOURCE SERVICES

#### PATHWAY: LAW ENFORCEMENT AND EMERGENCY SERVICES

Protecting public safety through law enforcement, security and protective services, and fire and emergency services.

- Provide emergency rescue/medical and hazardous materials services.
- Provide correctional services.
- Enforce compliance with government laws and regulations.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Fire Marshal</li> <li>• Police Officer</li> <li>• Emergency Medical Technician</li> <li>• Paramedic</li> <li>• Corrections Officer</li> <li>• Crime Technician</li> <li>• Dispatcher/Communications Officer</li> <li>• Fire Inspector</li> <li>• Fire Investigator</li> <li>• Security Officer-Public/Private</li> <li>• Emergency Manager</li> <li>• Accident Investigator</li> </ul>	<ul style="list-style-type: none"> <li>• Parole Officer</li> <li>• Case Manager</li> <li>• Counselor</li> <li>• Forensic Scientist</li> <li>• Fire Protection Engineer</li> <li>• Police Agent</li> <li>• Air Marshall</li> <li>• Customs Officer</li> </ul>	<ul style="list-style-type: none"> <li>• Federal Special Agent</li> </ul>

#### PATHWAY: LEGAL SERVICES

Providing legal services to individuals in communities and restricted environments.

- Implement the following services: civil, criminal, juvenile, and administrative judicial/court services; dispute resolution; and legal assistance services.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Mediator</li> <li>• Court Clerk</li> <li>• Court Reporter/Transcriber</li> <li>• Investigator (Private and Government)</li> <li>• Legal Assistant</li> <li>• Paralegal</li> <li>• Legal Secretary</li> </ul>	<ul style="list-style-type: none"> <li>• Assistant Court Commissioner</li> <li>• Law Clerk</li> <li>• Arbitrator</li> </ul>	<ul style="list-style-type: none"> <li>• Lawyer</li> <li>• Judge</li> <li>• Administrative Law Judge</li> <li>• Court Commissioner</li> <li>• Hearing Examiner</li> <li>• Court Master</li> </ul>

#### PATHWAY: HUMAN SERVICES

Providing psychological, social, and community services support to individuals and families.

- Implement the following services; early childhood development; mental health/addiction; individual, family, and community; financial support; and work-place/workforce support.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Childcare Worker</li> <li>• Housing Specialist</li> <li>• Child Support Worker</li> <li>• Human Services Associate</li> <li>• Mental Health Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Program Coordinator</li> <li>• Job Coach</li> <li>• Case Manager</li> <li>• Employment Counselor</li> <li>• Childcare Licensing Specialist</li> <li>• Employee Assistance Counselor</li> <li>• Recreational Therapist</li> </ul>	<ul style="list-style-type: none"> <li>• Human Resource Administrator</li> <li>• Psychologist</li> <li>• Speech Therapist</li> <li>• Speech Pathologist</li> <li>• Family Support Counselor</li> <li>• Social Worker</li> <li>• Psychiatrist</li> </ul>

## Career Cluster 7

### HUMAN RESOURCE SERVICES

#### PATHWAY: GOVERNMENT AND PUBLIC ADMINISTRATION

Providing legislative, administrative, and judicial services to carry out general-purpose government functions at the federal, state, and local levels and to provide for national security.

- Implement national security policy.
- Manage international relations.
- Manage research and information.
- Administer revenue and taxation plans.
- Administer grant programs.
- Conduct regulatory compliance and investigative services.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Policy Researcher</li> <li>• Public Affairs Assistant</li> </ul>	<ul style="list-style-type: none"> <li>• Program Administrator</li> <li>• Financial Administrator</li> <li>• Auditor</li> <li>• Public Affairs/Information Specialist</li> <li>• Budget Analyst</li> <li>• Policy Analyst</li> <li>• Government Official</li> <li>• Community Organizer/Development</li> <li>• Counterterrorism Specialist</li> <li>• Accountant</li> </ul>	<ul style="list-style-type: none"> <li>• Lawyer</li> <li>• Certified Public Accountant</li> </ul>

#### PATHWAY: EDUCATION AND TRAINING SERVICES

Providing education and training services, performance support, and organizational development services to improve organizational effectiveness.

- Provide K-16 instructional services and support services within public and private schools and colleges.
- Conduct training and performance support services for organizations and employees.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Teacher Assistant</li> <li>• Laboratory Technician</li> <li>• Teacher Paraprofessional</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-K-12 Teacher</li> <li>• Librarian/Information Specialist</li> <li>• Career Counselor</li> <li>• Placement Specialist</li> <li>• Admission Counselor</li> <li>• Financial Aid Advisor</li> <li>• Trainer</li> <li>• Organizational Developer</li> <li>• Performance Consultant</li> <li>• Academic Advisor</li> <li>• Postsecondary Instructor</li> <li>• Curriculum Developer</li> </ul>	<ul style="list-style-type: none"> <li>• College Professor</li> <li>• School or Postsecondary Administrator</li> <li>• Non-Public Pre-K-12 Teacher/Montessori</li> <li>• Guidance Counselor</li> <li>• Testing and Assessment Specialist</li> <li>• Reading Specialist</li> <li>• School Psychologist</li> <li>• ESL Specialist</li> <li>• Extension Educator</li> </ul>



## Career Cluster 7

### HUMAN RESOURCE SERVICES

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Information Technology and Communications Support:** Telecommunications, data and computer support services, including communications systems and devices, film and audio-visual services and equipment, computer software and hardware, and Internet services.
- **Financial Management and Accounting:** Business support services in finance and accounting, including budgeting and fiscal operations.
- **Legal Services:** Legal services that address all aspects of the organization, including purchasing contracts, leases, human resources, and risk management.
- **Government Relations/Legislative Affairs:** Managing government communications, lobbying, and managing relationships with government agencies at the federal, state, and local levels.
- **Human Resources/Training:** Business activities involved in recruiting and hiring employees, performance reviews, compensation and benefits management, labor relations, and compliance with government laws and regulations, and the training and development of employees, ranging from orientation to professional and management development.
- **Risk Management and Security:** Services that provide health, safety and environmental protection, insurance for employees and customers, loss prevention, compliance with government laws and regulations, and security.
- **Maintenance/Facility Support:** Services involving the maintenance of physical facilities, including architecture and design services, facility and equipment maintenance services, building cleaning services, and landscape and grounds planning and maintenance.
- **Marketing:** Market analysis, advertising, and promotion and communications services.
- **Health and Safety/Environmental Management:** Managing and improving health and safety, and maintaining compliance with legal and regulatory requirements, including OSHA and EPA.
- **Customer Relations:** Managing customer relations and insuring that customers receive the services they are promised and are satisfied with the services they receive.
- **Fundraising:** Seeking and securing financial resources for the organization, including government and foundation grants and corporate, community, and individual contributions.

#### HUMAN RESOURCE SERVICES

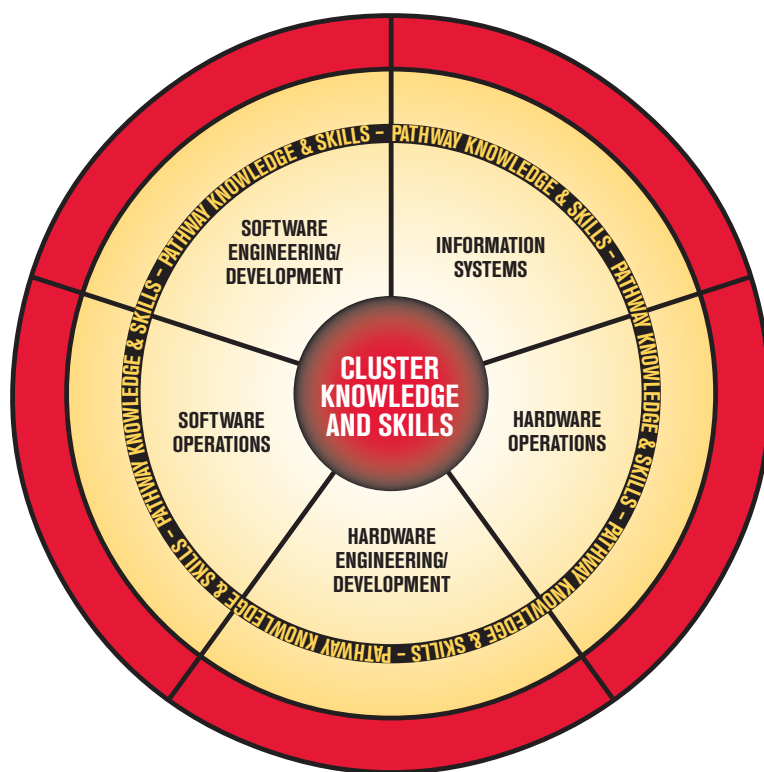
The Maryland Academy for Teacher Education aligns with the Interstate New Teacher Assessment and Support Consortium (INTASC) and the Maryland Essential Dimensions of Teaching (EdoTs). The program prepares students for further education and careers in the education profession. The high school program is designed to articulate to a Maryland postsecondary teacher education program. Upon completion of the program and passing the ParaPro test, 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, which aligns with the National Council for the Accreditation for Teacher Education (NCATE) standards. Postsecondary students completing the A.A.T. can become a paraprofessional or transfer to a bachelor's degree program to prepare to enter the teaching profession.

## Career Cluster 8

### INFORMATION TECHNOLOGY

#### INDUSTRY INSIGHTS

- Advances in information technology will continue to drive major innovations across all major industries throughout the world. These advances will also change the face of government and the non-profit sector. Businesses will continue to expand the use of information technology in all aspects of the business enterprise and will seek more comprehensive e-commerce and information management solutions to remain competitive.
- Information technology businesses and professionals will face increasing pressure to design, develop, implement, and support more complex and reliable information technology solutions that will meet the needs of external and internal customers. This will require that information technology professionals have the skills to determine customer and business needs and requirements, manage complex projects, integrate software and hardware solutions, and deliver total solutions on time that meet customer needs.
- The rapid pace of technological change and increased global competition will require that information technology professionals develop and continually update high-level technical, project management, and customer relations skills.



Looking at this industry as a whole, five pathways represent the major functions in the industry. Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate programs), private career schools, and employee sponsored programs. Professional certification is also an important

consideration when pursuing career opportunities. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.

## Career Cluster 8

### INFORMATION TECHNOLOGY

#### PATHWAY: SOFTWARE ENGINEERING/DEVELOPMENT

Designing, developing, and testing software solutions to meet customer needs. Expertise required in project management, programming languages, database design, security systems, and website development.

#### PATHWAY: SOFTWARE OPERATIONS

Installing, deploying, maintaining, and supporting software systems, including databases, software programs and packages, Web products, and security systems. Expertise required in project management.

- Monitor and manage software performance.
- Provide training and assistance to software users.

#### PATHWAY: HARDWARE ENGINEERING/DEVELOPMENT

Designing, developing, and testing new hardware technologies and products to meet customer needs. Expertise required in project management.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Web Designer/ Developer</li> <li>• Database Analyst</li> <li>• Database Tester</li> <li>• Data Analyst</li> <li>• Documentation Specialist</li> <li>• Software Applications Specialist</li> </ul>	<ul style="list-style-type: none"> <li>• Software Architect</li> <li>• Database Developer</li> <li>• Information Systems Architect</li> <li>• Lead Programmer</li> <li>• Applications Developer</li> <li>• Applications Analyst</li> <li>• Project Manager</li> <li>• Web Architect</li> </ul>	<ul style="list-style-type: none"> <li>• Business Analyst</li> <li>• Software Architect</li> <li>• Network Analyst</li> <li>• Systems Engineer</li> <li>• Operating Systems Designer/Engineer</li> <li>• Information Systems Architect</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Software Applications Trainer</li> <li>• Web Designer/Developer</li> <li>• Applications Support Specialist</li> <li>• Applications Support Analyst</li> <li>• Database Support Analyst</li> <li>• PC Support Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Database Administrator</li> <li>• Project Manager</li> <li>• Operations Systems Analyst</li> <li>• Database Administrator</li> <li>• Technical Writer / Editor</li> <li>• Product Support Engineer</li> <li>• Systems Technical Support Specialist</li> <li>• Technical Support Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• Project Manager</li> <li>• Operations Manager</li> <li>• Operations Systems Analyst</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• PC Support Technician</li> <li>• Network Technician</li> <li>• Network Administrator</li> </ul>	<ul style="list-style-type: none"> <li>• Operations Manager</li> <li>• Computer Designer</li> <li>• Project Manager</li> <li>• Circuit Designer</li> </ul>	<ul style="list-style-type: none"> <li>• Network Engineer</li> <li>• Mechanical Engineer</li> <li>• Computer Engineer</li> </ul>

## Career Cluster 8

### INFORMATION TECHNOLOGY

#### PATHWAY: HARDWARE OPERATIONS

Installing, configuring, maintaining, and supporting computer and network hardware to ensure secure and reliable system performance. Expertise required in project management.

- Computer Technician
- Network Technician
- Cabling Technician
- PC Support Technician

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Computer Technician</li> <li>• Network Technician</li> <li>• Cabling Technician</li> <li>• PC Support Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Network Administrator</li> <li>• Project Manager</li> <li>• Technical Writer/Editor</li> <li>• Product Support Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• Operations Manager</li> <li>• Network Engineer</li> <li>• Mechanical Engineer</li> <li>• Computer Engineer</li> </ul>

#### PATHWAY: INFORMATION SYSTEMS

Designing, implementing, and supporting computer network systems—both hardware and software—to ensure that systems meet business and user requirements. Expertise required in configuration management and project management.

- Plan and manage system development projects.
- Maintain system documentation.
- Control system access and maintain system security.
- Troubleshoot system performance problems.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Information System Administrator</li> <li>• Network Analyst</li> </ul>	<ul style="list-style-type: none"> <li>• Network Engineer</li> <li>• Network Administrator</li> <li>• Systems Tester</li> <li>• Security Analyst</li> <li>• Quality Assurance Manager</li> <li>• Project Manager</li> <li>• Systems Technical Support Specialist</li> <li>• Technical Support Engineer</li> <li>• Application Integrator</li> </ul>	<ul style="list-style-type: none"> <li>• Systems Architect</li> <li>• Systems Analyst</li> <li>• Systems Engineer</li> <li>• Operations System Engineer</li> <li>• Security Analyst</li> <li>• Operations System Program Manager</li> <li>• Chief Security Officer</li> </ul>

## Career Cluster 8

### INFORMATION TECHNOLOGY

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Business and Administrative Services:** Core business and administrative services found in all businesses, including finance and accounting services, human resource services, and administrative support services.
- **Customer Sales/Service and Relationship Management:** All activities involved in identifying customers, building and completing customer sales, responding to customer requests, and maintaining customer relationships.
- **User Services:** All major applications support services provided to end users in major customer markets.
- **User Applications Services:** All activities related to providing technical support regarding user applications.
- **User Applications Documentation – Technical Writing:** Developing information on the use, operation, and capabilities of specific user applications.

#### INFORMATION TECHNOLOGY

##### PROGRAM HIGHLIGHT

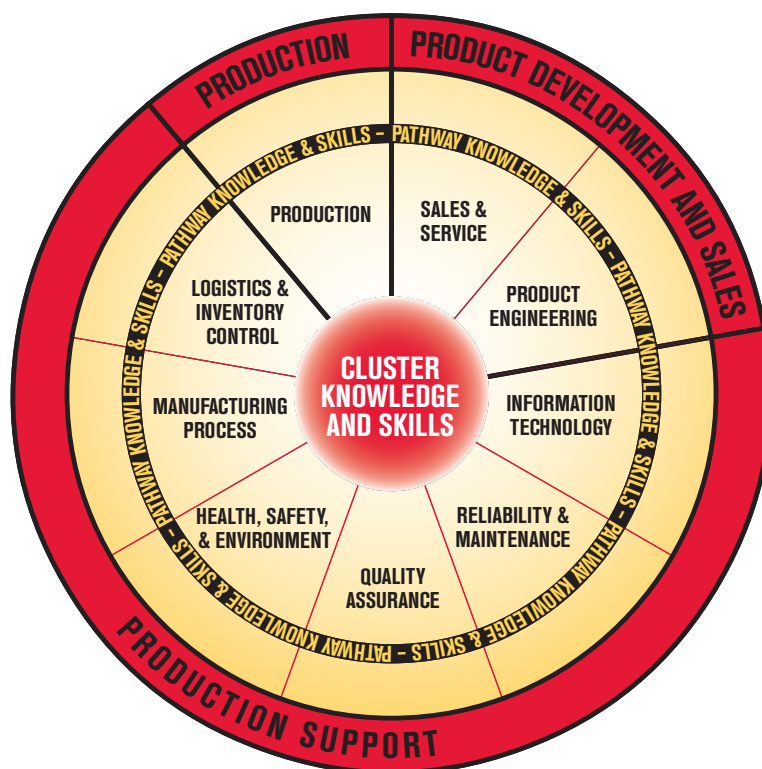
Through a partnership with the National Academy Foundation (NAF), Maryland's Academy of Information Technology features two specialized courses each semester and a college-level course in the senior year. The program offers courses such as Introduction to IT, Information Systems, Logic for Programming, Digital Networks, System Support and Maintenance, Advanced Web Tools, Digital Media, Programming, and Databases. This program introduces students to the broad career opportunities in today's digital workforce and, in the process, equips them with the personal, analytical, technical, and communications skills they need to succeed.

## Career Cluster 9

# MANUFACTURING, ENGINEERING, AND TECHNOLOGY

## INDUSTRY INSIGHTS

- The Maryland Manufacturing, Engineering, and Technology industry sector is an international enterprise with products that are designed, manufactured, and sold within a highly competitive global marketplace.
- American manufacturers are adopting leading global practices, such as lean manufacturing, to find new ways to produce high-quality products, better, faster, and more cost-effectively with as little waste as possible.
- American manufacturers face new health, safety, and environmental requirements and are searching for innovative ways to improve safety and lessen the environmental impacts of both products and processes. Advances in science and technology, such as materials science, engineering, and information technology, will continue to drive product and process innovation.
- With the increasing availability of information technology, the industry will use logistics and resource planning systems on a greater industry-wide basis. As supply chains become even more global, this will improve the way suppliers, manufacturers, and customers interact with each other.



Looking at the industry as a whole, three core areas—Production, Product Development and Sales, and Production Support—organize the pathways according to major functions in the industry. Within the core areas, Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate

programs), private career schools, and employee sponsored programs. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills needed to understand the entire industry. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.



## Career Cluster 9

### MANUFACTURING, ENGINEERING, AND TECHNOLOGY

#### CORE AREA 1: PRODUCTION

##### PATHWAY: PRODUCTION

Producing products and continuously improving production processes to meet customer and business requirements.

- Manage production operations.
- Operate and control production equipment.
- Provide technical support to production.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS

- Manufacturing Technician
- Production Assembler
- CAD/CAM Technician
- Production Supervisor
- Production Team Leader
- Production Operator
- Materials Management Specialist

WITH A BACHELOR'S DEGREE

- Manufacturing Engineer
- Product Engineer
- Controls Engineer
- Systems Engineer
- Project Manager
- Program Manager

#### CORE AREA 2: PRODUCT DEVELOPMENT AND SALES

##### PATHWAY: PRODUCT ENGINEERING

Designing, developing, or modifying products to meet market and customer requirements.

- Design and develop products through concurrent engineering processes that integrate product and process development.
- Improve the manufacturability and sustainability of products.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS

- Engineering Technician
- CAD Technician

WITH A BACHELOR'S DEGREE

- Manufacturing Engineer
- Six Sigma Manager
- Test Engineer
- Materials Engineer
- Systems Engineer

##### PATHWAY: MANUFACTURING SALES AND SERVICE

Marketing, selling, customer service, and overall customer relationship management.

- Identify and analyze customer value, markets, and products.
- Identify potential customers.
- Establish and maintain relationships with potential and existing customers.
- Promote and sell products and services to customers.
- Provide customer service, including providing product information, tracking and reporting the progress of customer orders, answering questions, resolving problems, and providing technical support in the use and disposal of products.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS

- Sales Agent
- Customer Service Representative
- Contract Specialist
- Sales Coordinator

WITH A BACHELOR'S DEGREE

- Marketing Manager
- Sales Manager
- Customer Service Manager
- Sales and Application Manager

## Career Cluster 9

### MANUFACTURING, ENGINEERING, AND TECHNOLOGY

#### CORE AREA 3: PRODUCTION SUPPORT

##### PATHWAY: LOGISTICS AND INVENTORY CONTROL

Manage the supply chain from suppliers through production to end-use customers using enterprise-wide resource planning systems.

- Plan and control production.
- Manage purchasing and just-in-time materials flow, shipping and receiving, packaging, and transportation.
- Control inventory of material and products.
- Manage product support, including parts and warranty issues.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Expediter</li> <li>• Inventory Specialist</li> <li>• Material Handler</li> <li>• Contract Specialist</li> <li>• Information Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Logistics Analyst</li> <li>• Logistics Engineer</li> <li>• Production Planner and Scheduler</li> <li>• Inventory Manager</li> <li>• Purchasing Manager</li> </ul>

##### PATHWAY: MANUFACTURING PROCESS

Designing, implementing, and continually improving manufacturing processes.

- Develop manufacturing process plans and documentation.
- Audit manufacturing processes and systems.
- Provide technical support to production to prevent errors, and reduce process variability and waste.
- Manage continuous process improvement.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• CAD/CAM Technician</li> <li>• Engineering Technician</li> <li>• Documentation Specialist</li> </ul>	<ul style="list-style-type: none"> <li>• Process Engineer</li> <li>• Tooling Engineer</li> <li>• Manufacturing Engineer</li> <li>• Product Change Coordinator</li> <li>• Six Sigma Manager</li> </ul>

##### PATHWAY: QUALITY ASSURANCE

Ensuring that products meet customer requirements and supporting continuous improvement.

- Determine customer requirements.
- Develop and implement quality systems, including monitoring processes and testing product quality.

##### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Quality Technician</li> <li>• Inspector</li> <li>• Non-Destructive Tester</li> <li>• Documentation Control Technician</li> <li>• Product/Process Validation Specialist</li> <li>• Metrology/Calibration Specialist</li> </ul>	<ul style="list-style-type: none"> <li>• Reliability Engineer</li> <li>• Quality Engineer</li> <li>• Mechanical Engineer</li> <li>• Six Sigma Manager</li> </ul>

## Career Cluster 9

### MANUFACTURING, ENGINEERING, AND TECHNOLOGY

#### PATHWAY: RELIABILITY AND MAINTENANCE

Maintaining the reliability and performance of manufacturing systems to ensure the maximum utilization of capital assets.

- Select production equipment.
- Plan space and layout.
- Operate total productive maintenance systems.

#### PATHWAY: INFORMATION TECHNOLOGY

Designing, implementing, and supporting computer network systems (hardware and software) to ensure that systems—enterprise-wide resource management systems and e-commerce support systems—meet business and user requirements.

- Plan and manage system development projects.
- Install and configure network hardware and software.
- Maintain system documentation.
- Control system access and maintain system security.
- Troubleshoot system performance problems.
- Provide user training and support.

#### PATHWAY: HEALTH, SAFETY, AND ENVIRONMENTAL

Designing, planning, implementing, and supporting health and safety and environmental management systems to maintain organizational compliance with government laws and regulations.

- Improve health, safety, and environmental performance such as moving toward zero discharge, designing for green, and recycling.
- Achieve organizational wellness through ergonomic and health promotion efforts.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• CAD/CAM Technician</li> <li>• Maintenance Mechanic</li> <li>• Electrician</li> <li>• Maintenance Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Facility Engineer</li> <li>• Mechanical Engineer</li> <li>• Electrical Engineer</li> <li>• Six Sigma Manager</li> <li>• Systems Engineer</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• User Support Specialist</li> <li>• PC/System Technician</li> <li>• Network Technician</li> <li>• Software Support Specialist</li> </ul>	<ul style="list-style-type: none"> <li>• Software Engineer</li> <li>• Programmer</li> <li>• Network Administrator</li> <li>• System Engineer</li> <li>• Knowledge Engineer</li> <li>• Product Data Manager</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Laboratory Technician</li> <li>• Health and Safety Technologist</li> </ul>	<ul style="list-style-type: none"> <li>• Safety Engineer</li> <li>• Ergonomic Engineer</li> <li>• Environmental Engineer</li> <li>• Industrial Engineer</li> <li>• Scientist</li> <li>• Remediation Specialist</li> </ul>

## Career Cluster 9

### MANUFACTURING, ENGINEERING, AND TECHNOLOGY

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Human Resources:** Business activities involved in recruiting and hiring employees, performance reviews, compensation and benefits management, labor relations, and compliance with government laws and regulations.
- **Training:** All types of learning services, including company and vendor training.
- **Legal Services:** Legal services that address all aspects of the business, including contracts, human resources, and risk management.
- **Financial Management and Accounting:** Financial and accounting services that manage financial resources and manage and report the revenues and costs of manufacturing businesses.
- **Security:** Business activities involved in property loss prevention and ensuring the personal security of employees.

#### MANUFACTURING, ENGINEERING, AND TECHNOLOGY

##### PROGRAM HIGHLIGHT

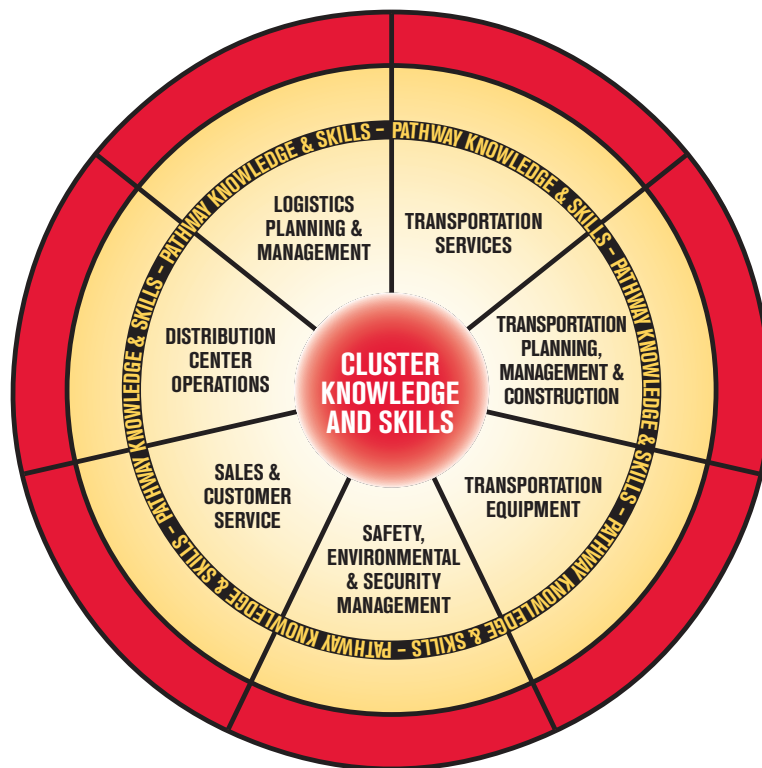
Maryland's Project Lead The Way (PLTW) program is a sequence of courses which, when combined with traditional mathematics and science courses in high school, introduces students to the scope, rigor, and discipline of engineering and engineering technology prior to entering college. There are eight courses in the PLTW program which are divided into three groups: Foundation (Principles of Engineering, Introduction to Engineering Design and Digital Electronics); Pathway (Computer Integrated Manufacturing, Civil Engineering and Architecture, Aerospace Engineering and Biotechnical Engineering); and Capstone (Engineering Design and Development). Students in the Project Lead The Way pre-engineering program take all of the foundation courses, one pathway course, and the capstone course. Opportunities to earn articulated credit are offered to students who successfully complete the requirements for entrance into the two- or four-year college program.

## Career Cluster 10

# TRANSPORTATION TECHNOLOGIES

## INDUSTRY INSIGHTS

- The expansion of global trade and travel, and advances in logistics and distribution management in manufacturing and wholesale and retail trade are driving the growth of the transportation sector.
- The transportation sector is becoming increasingly integrated and intermodal across all types of transportation, including air, water, roadway, rail, and metropolitan transit systems. Many businesses are now providing comprehensive services, including logistics planning and management, inventory management, and transportation.
- 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 fewer environmental and safety risks. These innovations require higher skills to manage and maintain transportation equipment.
- Advances in transportation technology and information technology, the growth in global transportation, and increased security and safety concerns are creating the need for an expanded and more advanced public transportation infrastructure, including intelligent transportation systems, and advances in the management of this infrastructure at the local, state, and federal levels.



Looking at this industry as a whole, seven pathways represent the major functions in the industry. Career Pathways show more specific business activities that offer a range of related career opportunities. Students can prepare for a variety of career options through two and four-year colleges (including graduate programs), private career schools, and employee sponsored

programs. Appropriate work experience may also be important to increase career opportunities. The center circle represents the common knowledge and skills required of anyone in this career. As students focus on a more specific Career Pathway, they advance their readiness for careers in that pathway.

## Career Cluster 10

### TRANSPORTATION TECHNOLOGIES

#### PATHWAY: TRANSPORTATION OPERATIONS

Moving people, freight (goods and materials), and information through one or multiple (intermodal) modes of transportation, including air, water, roadway, rail, and public transit systems.

- Dispatch, control, operate, and support mobile equipment, including trains, ships, airplanes, trucks, buses, and cars.
- Manage people, information, and inventory.
- Provide customer service.
- Communicate with and educate customers on improving the use of transportation services.
- Maintain and improve safety compliance and performance.

#### PATHWAY: LOGISTICS PLANNING AND MANAGEMENT

Planning and analyzing the movement of people, freight (goods and materials), and information. Managing organizational assets to improve the quality of services and lower costs.

- Select transportation modes and carriers.
- Locate transportation hubs and distribution centers.
- Develop transportation routes and schedules.
- Determine packaging and material handling requirements.
- Determine documentation and information requirements for domestic and international transporting.
- Analyze problems to improve performance.

#### PATHWAY: DISTRIBUTION CENTER OPERATIONS

Managing and operating warehouses and distribution centers.

- Process, sort, assemble, package, and handle incoming and outgoing materials and products.
- Manage people and provide customer service.
- Maintain and improve safety compliance and performance.
- Control inventories maintained within distribution centers.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Truck Driver</li> <li>• Pilot</li> <li>• Fueler</li> <li>• Air Traffic Controller</li> <li>• Dispatcher</li> <li>• Scheduler</li> <li>• Bus Driver</li> <li>• Ship Captain</li> <li>• Harbor Master</li> <li>• Flight Attendant</li> <li>• Conductor</li> <li>• Train Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• Military Flight Operations Manager</li> <li>• Airport Manager</li> <li>• Quality Manager</li> <li>• Flight Service Manager</li> <li>• Business Process Engineer</li> <li>• Process Improvement Manager</li> <li>• Operations Manager</li> <li>• Terminal Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Operations Research Systems Analyst</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• CAD Technician</li> <li>• Route Planner</li> <li>• Traffic Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Logistics Analyst</li> <li>• Traffic Engineer</li> <li>• Industrial Engineer</li> <li>• Demographer</li> <li>• Transportation Planner</li> <li>• CAD Engineer</li> <li>• Logistics Engineer</li> </ul>

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Forklift Operator</li> <li>• Warehouse Supervisor</li> <li>• Parts Manager</li> <li>• Hazardous Materials Specialist</li> <li>• Database Specialist</li> <li>• Inventory Specialist</li> <li>• Stationary Engineer</li> <li>• Shipping Specialist</li> <li>• Receiving Specialist</li> <li>• Physical Distribution Manager</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial Engineer</li> <li>• Distribution Center Manager</li> <li>• Inventory Manager</li> <li>• Quality Control Manager</li> <li>• Import/Export Manager</li> <li>• Logistics Engineer</li> <li>• Industrial Engineering Technician</li> </ul>



## Career Cluster 10

### TRANSPORTATION TECHNOLOGIES

#### PATHWAY: SAFETY, ENVIRONMENTAL, AND SECURITY MANAGEMENT

Complying with government laws and regulations in safety, health, and environmental management.

Maintaining security in transportation facilities and operations.

- Prevent and reduce losses due to theft and product damage.
- Investigate safety, environmental, and security problems, and improve performance.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Safety or Environmental Inspector</li> <li>• Accident Investigator</li> <li>• Material and Equipment Inspector</li> <li>• Emergency Manager</li> <li>• Emissions Inspector</li> <li>• Security Investigator</li> <li>• Security Officer</li> <li>• Flight Attendant</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Analyst</li> <li>• Public Administrator</li> <li>• Traffic Safety Officer</li> <li>• Civil Engineer</li> <li>• Occupational Safety Officer</li> <li>• Air Marshal</li> <li>• Customs Officer</li> <li>• Process Improvement Manager</li> <li>• Coast Guard Officer</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental Lawyer</li> </ul>

#### PATHWAY: TRANSPORTATION PLANNING, MANAGEMENT, AND CONSTRUCTION

Planning, designing, constructing, and maintaining public and private transportation facilities and infrastructure, including:

- Highways
- Ports
- Airports
- Train terminals
- Railways

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Construction Supervisor</li> <li>• Engineering Technician</li> <li>• Drafter/CAD Technician</li> <li>• Surveyor</li> <li>• Security Engineer</li> <li>• Facility Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• Transportation Planner</li> <li>• Traffic Engineer</li> <li>• Civil Engineer</li> <li>• Highway Engineer</li> <li>• Real Property Officer</li> <li>• Environmental Specialist</li> <li>• Systems Engineer</li> <li>• Structural Engineer</li> <li>• Government Agency Administrator</li> <li>• Architect</li> </ul>	<ul style="list-style-type: none"> <li>• Lawyer</li> </ul>

#### PATHWAY: SALES AND CUSTOMER SERVICE

Performing sales and customer service functions.

- Promoting and selling logistics and transportation services and equipment.
- Providing ongoing customer service to businesses and consumers.

#### SAMPLE CAREER OPTIONS

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE
<ul style="list-style-type: none"> <li>• Reservation Agent</li> <li>• Customer Service Representative</li> <li>• Salesperson</li> <li>• Service Writer</li> <li>• Leasing Specialist</li> <li>• Title/Registration Administrator</li> </ul>	<ul style="list-style-type: none"> <li>• General Manager</li> <li>• Market Analyst</li> <li>• Marketing Manager</li> <li>• Sales Manager</li> <li>• Parts Manager</li> <li>• Contract Officer</li> <li>• Procurement Officer</li> <li>• Finance Specialist</li> </ul>

## Career Cluster 10

### TRANSPORTATION TECHNOLOGIES

#### **PATHWAY: TRANSPORTATION EQUIPMENT**

Planning, designing, manufacturing, and maintaining transportation equipment, including:

- Automobiles
- Trucks
- Buses
- Airplanes
- Ships
- Trains

#### **SAMPLE CAREER OPTIONS**

WITH AN ASSOCIATE'S DEGREE OR LESS	WITH A BACHELOR'S DEGREE	WITH MORE THAN A BACHELOR'S DEGREE
<ul style="list-style-type: none"><li>• Parts Manager</li><li>• Automotive Technician</li><li>• Collision Repair Technician</li><li>• Fleet Maintenance Manager</li><li>• Airframe Mechanic</li><li>• Power Plant Mechanic</li><li>• Diesel Mechanic</li><li>• Railcar Technician</li><li>• Materials Specialist</li><li>• Welder</li></ul>	<ul style="list-style-type: none"><li>• Mechanical Engineer</li><li>• Aerospace Engineer</li><li>• Design Engineer</li><li>• Structural Engineer</li><li>• Electrical Engineer</li><li>• Computer Engineer</li><li>• Mechanical Engineer</li><li>• Manufacturing Engineer</li><li>• Civil Engineer</li><li>• Manufacturing Operations Manager</li><li>• Process Engineer</li><li>• Integration Engineer</li></ul>	<ul style="list-style-type: none"><li>• Systems Engineer</li><li>• Quality Engineer</li></ul>

## Career Cluster 10

### TRANSPORTATION TECHNOLOGIES

#### CROSS-CLUSTER SKILL AREAS

In addition to focusing on a Pathway, students gain transferable skills across Career Clusters. These cross-cluster skills broaden a student's understanding of how different careers connect and intersect.

- **Information Technology and Communications Support:** Telecommunications, data, and computer support services, including communications systems and devices and equipment, computer software and hardware, and Internet services.
- **Financial Management and Accounting:** Business support services in finance and accounting.
- **Purchasing and Procurement:** Purchasing materials and equipment for organizations involved in performing and distributing.
- **Legal Services:** Legal services that address all aspects of the business, including purchasing contracts, leases, human resources, and risk management.
- **Public Policy/Government Relations:** Managing government communications, lobbying, and managing relationships with government agencies at the federal, state, and local levels.
- **Human Resources/Training and Labor Relations:** Business activities involved in recruiting and hiring employees, conducting performance reviews, handling compensation and benefits management, labor relations, and complying with government laws and regulations. It also refers to the training and development of employees, ranging from orientation to professional and management development.
- **Marketing and Sales:** Market analysis, advertising and promotion, sales, and customer service.
- **Construction Equipment and Material Supply:** Providing necessary construction equipment and materials to construct transportation facilities and infrastructure.

#### TRANSPORTATION TECHNOLOGIES

The National Automotive Technicians Education Foundation (NATEF), an affiliate of the National Institute for Automotive Service Excellence (ASE), has established the rigorous technical standards by which training facilities, programs and individual technicians become certified. Programs of study offer high school students up to 18 articulated college credits. Students can go directly to work in the industry or continue their education to earn an Associate of Applied Science Degree (AAS) along with advanced automotive manufacturer and industry certifications, i.e. Ford ASSET and Toyota T-Ten. Postsecondary students interested in further continuing their education and career options can receive full credit for their AAS degree towards a Bachelor of Science Degree in Automotive Technology Management.

PROGRAM  
HIGHLIGHT

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# MARYLAND CAREER CLUSTERS



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