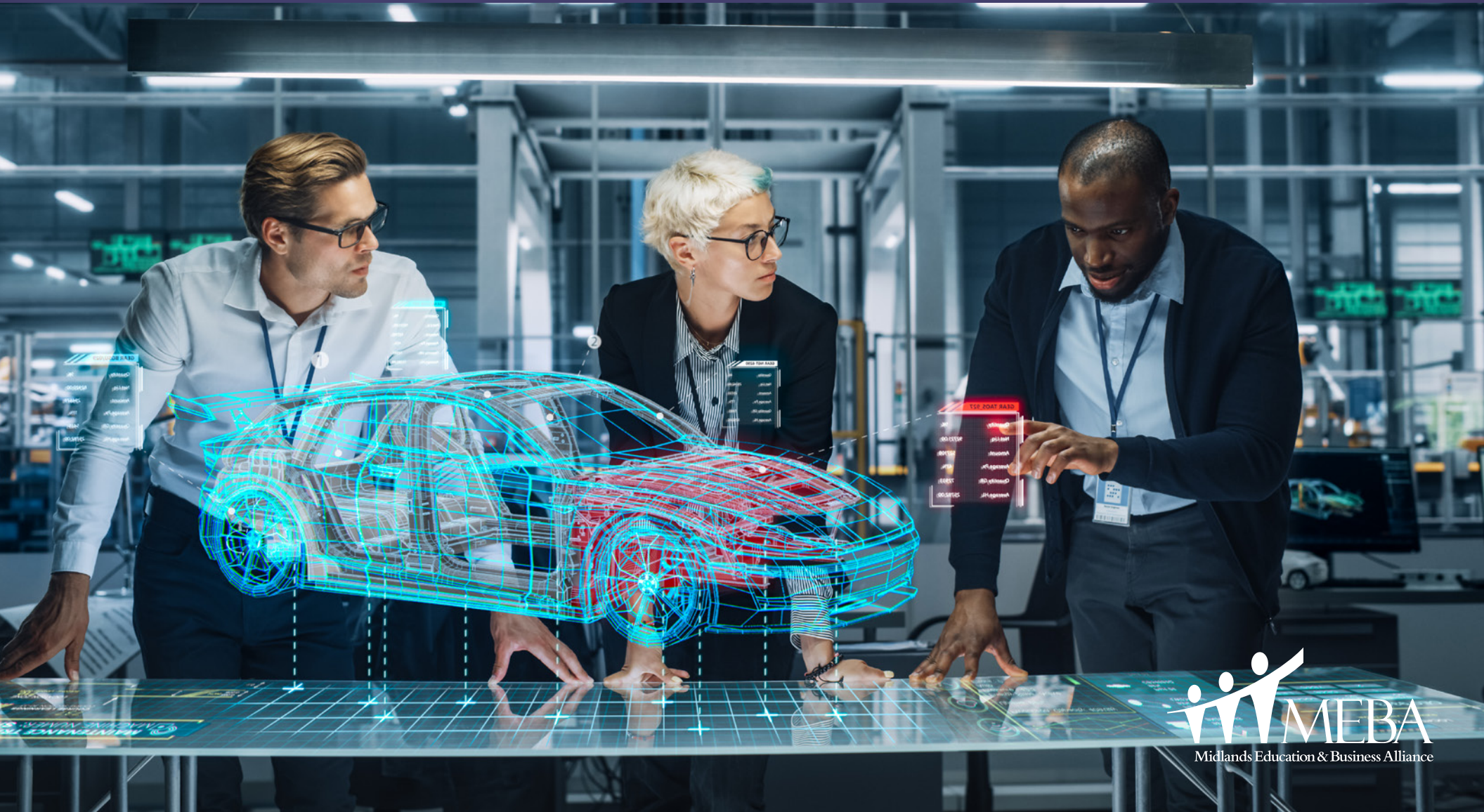


Be a Part of Manufacturing





Make the World Run: Careers in Manufacturing

In the United States, manufacturing accounts for nearly one in six private sector domestic jobs, making our country the world's leading technological innovator. According to the US Department of Commerce, manufacturing has a higher multiplier effect on the economy than any other sector. For every \$1 in manufacturing value added, \$1.81 in additional value is created in other industry sectors, including retail trade, transportation, information, agriculture, government and business services.

In South Carolina, manufacturing produced between \$34 - 37 billion in 2019 in economic activity, providing a wide array of dynamic and emerging career opportunities. Manufacturing represents 12.6 percent of all jobs in South Carolina. After accounting for the secondary multiplier effect, that percentage jumps to 30.2%, making it the largest employment sector in the state.

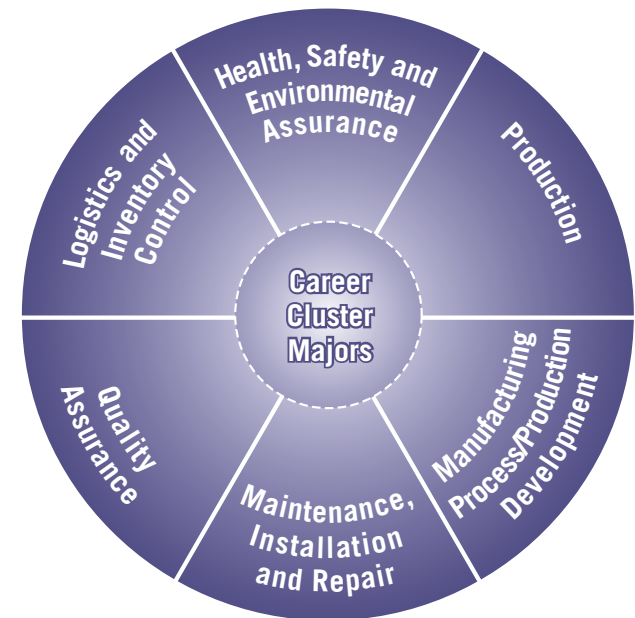
The Manufacturing Career Cluster

The Manufacturing Career Cluster is divided into six majors. They are as follows:

- Production
- Manufacturing Process/Production Development
- Maintenance, Installation and Repair
- Quality Assurance
- Logistics and Inventory Control
- Health, Safety and Environmental Assurance

Each of these majors is unique in educational, developmental and experience requirements and is aligned to industry careers as defined by national and international standards groups.

These six majors require knowledge and skills that can be acquired in post-secondary institutions, which range from private career and company-sponsored schools to two-year institutions, such as Midlands Technical College, and four-year colleges, such as the University of South Carolina.





Production: The production major involves the construction and/or assembly of mechanical parts for various products, ranging from air conditioners to airplanes and from automobiles to smartphones.

If you choose Production as your career major, you may be a part of:

- Assembling parts or units, and positioning, aligning and fastening units to frames for proper fit using hand tools and power tools
- Inspecting, testing and adjusting completed units to ensure that units meet specifications and customer order requirements
- Operating automated assembling equipment, such as robotics, fixed automation equipment and small cranes to transport or position large parts
- Reading blueprints and specifications to determine component parts and assembly sequences of electromechanical units

Sample Careers

Associate's Degree or Less
Annual Salary Range
\$20,000-\$50,000

- Production, Planning or Expediting Clerk
- Electromechanical Equipment Operator
- Painting and Coating Worker
- Computer Controlled Machine Operator

Bachelor's Degree
Annual Salary Range
\$50,000-\$100,000

- Manufacturing Engineer or Technologist
- First-Line Supervisor of Production and Operating Workers
- Power Plant Operator

Career	Entry-Level Education	Annual Median Salary & Hourly Pay (2021)	Job Outlook (2021-31)	Responsibilities	Skills
Machinists and Tool & Die Makers	High School Diploma or Equivalent	\$47,940/year \$23.05/hour	7% (Average)	<ul style="list-style-type: none"> • Work from blueprints, sketches or computer-aided design (CAD) or computer-aided manufacturing (CAM) files • Calculate dimensions using measuring instruments • Install, align, secure and adjust cutting tools and workpieces • Test completed tools or dies to ensure that they meet specifications • Inspect for proper dimensions and defects 	<ul style="list-style-type: none"> • Analytical skills • Detail oriented • Communication skills • Critical thinking skills • Math skills • Observation skills
Industrial Machinery Mechanic	High School Diploma or Associate's Degree plus On-the-Job Training	\$59,380/year \$28.55/hour	19% (Faster than average)	<ul style="list-style-type: none"> • Perform precision maintenance, troubleshooting and repair of electrical and mechanical systems, such as process controls, instrumentation, switching systems, power supplies and generators • Interpret complex mechanical, hydraulic or pneumatic prints • Repair, replace or reassemble defective equipment parts using hand tools and power tools • Record type and cost of maintenance or repair work 	<ul style="list-style-type: none"> • Analytical skills • Detail oriented • Communication skills • Critical thinking skills • Math skills • Observation skills
Industrial Production Managers	Bachelor's Degree	\$106,530/year \$55.48/hour	5% (Average)	<ul style="list-style-type: none"> • Decide how best to use a plant's workers and equipment to meet production goals • Ensure that production stays on schedule and within budget • Hire, train and evaluate workers • Analyze production data • Write routine production reports • Fix any production problems that may arise 	<ul style="list-style-type: none"> • Communication skills • Math skills • Operations analysis • Problem solving skills • Teamwork • Writing skills



Manufacturing Process/Production Development: People who work in this major merge their creativity with their technical know-how, as they are responsible for designing machinery and tooling as well as monitoring the production and materials used in the manufacturing process.

If you choose Manufacturing Process/Production Development as your career major, you may be a part of:

- Analyzing technology and resource needs to plan and assess the feasibility of projects
- Coordinating and directing projects via detailed plans to accomplish goals
- Directing, reviewing and approving product design and changes
- Analyzing complex systems to determine potential for further development
- Designing and building tooling such as fixtures, dies and mechanisms required to support the manufacturing operation

Sample Careers

Associate's Degree or Less

Annual Salary Range

\$35,000-\$75,000

- Drafter
- Precision Inspector, Tester or Grader
- Computer Numerical Control Setup Operator
- Engineering Technician
- Precision Machining Technician

Bachelor's Degree

Annual Salary Range

\$75,000-\$150,000+

- Electrical or Electronics Engineer
- Industrial Production Manager
- Labor Relations Manager
- Architectural or Engineering Manager
- Mathematician
- Training or Development Manager

Career	Entry-Level Education	Annual Median Salary & Hourly Pay (2021)	Job Outlook (2021-31)	Responsibilities	Skills
Industrial Engineering Technicians	Associate's Degree	\$60,222/year \$28.95/hour	4% (Average)	<ul style="list-style-type: none"> • Suggest revisions for methods of operation, material handling or equipment layout • Interpret engineering drawings, schematic diagrams and formulas • Work with management or engineering staff to determine quality and reliability standards • Prepare charts, graphs and diagrams to illustrate workflow, routing, floor layouts, how materials are handled and how machines are used 	<ul style="list-style-type: none"> • Analytical skills • Detail oriented • Communication skills • Critical thinking skills • Math skills • Observation skills
Industrial Engineers	Bachelor's Degree	\$95,300/year \$45.82/hour	14% (Faster than average)	<ul style="list-style-type: none"> • Review production schedules, engineering specifications, process flows and other information to understand manufacturing and service methods • Determine how to manufacture parts or products or deliver services with maximum efficiency • Develop management control systems to make financial planning and cost analysis more efficient • Work with customers and management to develop standards for design and production 	<ul style="list-style-type: none"> • Critical thinking skills • Listening skills • Math skills • Problem solving skills • Speaking skills • Teamwork • Writing skills
Mechanical Engineers	Bachelor's Degree	\$95,300/year \$45.82/hour	7% (Average)	<ul style="list-style-type: none"> • Design or redesign mechanical devices, creating blueprints so the device can be built • Develop a prototype of the device and test the prototype • Use computers extensively to produce and analyze designs, simulate and test how a machine is likely to work and generate specifications for parts • Analyze the test results and change the design as needed • Oversee the manufacturing process for a device 	<ul style="list-style-type: none"> • Creativity • Listening skills • Math skills • Mechanical skills • Problem solving skills
Materials Engineers	Bachelor's Degree	\$98,300/year \$47.26/hour	8% (Average)	<ul style="list-style-type: none"> • Develop, process and test materials used to create a range of products, from computer chips and aircraft wings to golf clubs and snow skis • Select materials and develop new ways to use materials in manufacturing • Monitor how materials perform and evaluate how they deteriorate • Determine causes of product failure and develop solutions • Evaluate technical specifications and economic factors relating to the design objectives of processes or products 	<ul style="list-style-type: none"> • Communication skills • Math skills • Operations analysis • Problem solving skills • Teamwork • Writing skills



Maintenance, Installation and Repair: Employees in this line of work perform preventative maintenance and troubleshooting procedures on machines, tools and other equipment, as well as repair electrical and mechanical systems, identify mechanical problems and record repair tasks through a computer database.

If you choose Maintenance, Installation and Repair as your career major, you may be a part of:

- Assembling, installing or repairing mechanical and electrical parts
- Dismantling devices to access and remove defective parts, using hoists, cranes, hand tools and power tools
- Performing routine preventive maintenance and troubleshooting to ensure mechanical systems continue to run smoothly
- Identifying mechanical problems and determining how to correct them using drawings, blueprints, maintenance manuals and schematic diagrams

Sample Careers

Associate's Degree or Less
Annual Salary Range
\$20,000-\$45,000

- Industrial Troubleshooter
- Reliability Technician
- Maintenance Technician
- Electric Motor, Power Tool or Related Repairer
- Welder, Cutter, Solderer or Brazer

Bachelor's Degree
Annual Salary Range
\$45,000-\$75,000+

- Electrician
- Electrical or Electronics Repairer

Career	Entry-Level Education	Annual Median Salary & Hourly Pay (2021)	Job Outlook (2021-31)	Responsibilities	Skills
Industrial Machinery Mechanics and Maintenance Workers	High School Diploma or Equivalent	\$59,380/year \$28.55/hour	19% (Faster than Average)	<ul style="list-style-type: none"> • Maintain and repair complex machines, such as an automobile assembly line's conveyor belts, robotic welding arms and hydraulic lifts • Read technical manuals to understand equipment and controls • Disassemble machinery and equipment when there is a problem • Perform diagnostic tests on machinery • Adjust equipment and reset or calibrate sensors and controls 	<ul style="list-style-type: none"> • Manual dexterity • Mechanical skills • Problem solving skills • Reading comprehension skills • Technical skills
Millwrights	High School Diploma or Equivalent	\$60,330/year \$31.42/hour	4% (Average)	<ul style="list-style-type: none"> • Install or repair machinery and equipment • Read highly technical instructions and blueprints on machinery • Replace defective parts of machinery as needed • Move machinery and equipment • Take apart existing machinery to clear floor space for new machinery 	<ul style="list-style-type: none"> • Mechanical aptitude • Physical strength • Reading comprehension skills • Technical skills • Troubleshooting skills
Stationary Engineers/Boiler Operator	High School Diploma or Equivalent	\$63,500/year \$33.01/hour	6% (Average)	<ul style="list-style-type: none"> • Manage industrial equipment such as stationary engines and generators • Inspect equipment to ensure that it is operating efficiently • Check safety devices routinely • Record data and keep logs of operation, maintenance and safety activity • Repair malfunctioning equipment 	<ul style="list-style-type: none"> • Detail oriented • Manual dexterity • Mechanical skills • Problem solving skills • Technical skills
First-Line Supervisors of Mechanics, Installers and Repairers	Associate's Degree	\$71,260/year \$37.11/hour	9% (Average)	<ul style="list-style-type: none"> • Directly supervise and coordinate the activities of mechanics, installers and repairers • Determine schedules, sequences and assignments for work activities based on work priority, quantity of equipment and skill of personnel • Examine objects, systems or facilities and analyze information to determine needed installations, services or repairs • Monitor tool and part inventories and the condition and maintenance of shops to ensure adequate working conditions 	<ul style="list-style-type: none"> • Analytical skills • Coordination skills • Critical thinking skills • Judgment skills • Listening skills • Speaking skills • Time management skills



Quality Assurance: People who work in this major monitor and maintain mechanical and electrical parts during the manufacturing process. In addition, they ensure that industry standards and procedures are followed and that products and services meet specific performance measures.

If you choose Quality Assurance as your career major, you may be a part of:

- Analyzing and reviewing data to find specific types of quality problems
- Collecting and presenting necessary information needed for quality analysis
- Making recommendations to management to improve the production process based on findings from a quality assurance analysis
- Monitoring and documenting results of new procedures after implementation to show quality improvements

Sample Careers

Associate's Degree or Less
Annual Salary Range
\$30,000-\$45,000

- Calibration Technician
- Inspector, Tester, Sorter, Sampler or Weigher
- Quality Control Technician
- Quality Process Technician

Bachelor's Degree
Annual Salary Range
\$45,000-\$100,000

- Quality Assurance Engineer
- Lab Technician
- Statistical Process Control (SPC) Coordinator

Bachelor's Degree+
Annual Salary Range
\$75,000-\$150,000+

- Quality Assurance Manager
- Quality Assurance Director

Career	Entry-Level Education	Annual Median Salary & Hourly Pay (2021)	Job Outlook (2021-31)	Responsibilities	Skills
Quality Control Inspectors	High School Diploma or Equivalent	\$38,580/year \$18.55/hour	-12% (Decline)	<ul style="list-style-type: none"> • Monitor or observe operations to ensure they meet production standards • Inspect, test or measure materials or products being produced • Accept or reject finished items • Report inspection and test data • Recommend adjustments to the process or assembly 	<ul style="list-style-type: none"> • Dexterity • Math skills • Mechanical skills • Physical strength • Stamina • Technical skills
Quality Control Analysts	Bachelor's Degree	\$49,030/year \$23.57/hour	8% (Average)	<ul style="list-style-type: none"> • Conduct routine and non-routine analyses of in-process materials, raw materials and finished goods • Interpret test results, compare them to established specifications and control limits and make recommendations on appropriateness of data for release • Investigate or report questionable test results • Calibrate, validate or maintain laboratory equipment • Complete documentation needed to support testing procedures including data capture forms, equipment logbooks or inventory 	<ul style="list-style-type: none"> • Decision making skills • Judgment • Listening skills • Reading comprehension skills • Speaking skills • Writing skills
Software Quality Assurance Engineers and Testers	Bachelor's Degree	\$110,140/year \$52.95/hour	22% (Much Faster than Average)	<ul style="list-style-type: none"> • Design test plans, scenarios or manufacturing procedures • Document software defects and report defects to software developers • Identify, analyze and document problems with program function, output, online screen or content • Participate in product design reviews to provide input on functional requirements, product designs, schedules or potential problems • Review software documentation to ensure technical accuracy, compliance or to mitigate risks 	<ul style="list-style-type: none"> • Computer programming skills • Critical thinking skills • Listening skills • Problem solving skills • Speaking skills • Writing skills
Quality Control Systems Managers	Bachelor's Degree	\$103,150/year \$49.59/hour	8% (Average)	<ul style="list-style-type: none"> • Collect and analyze production samples to evaluate quality • Stop production if serious product defects are present • Monitor performance of quality control systems to ensure effectiveness and efficiency • Instruct staff in quality control and analytical procedures • Identify critical points in the manufacturing process and specify sampling procedures to be used at these points 	<ul style="list-style-type: none"> • Critical thinking skills • Decision making skills • Judgment • Listening skills • Problem solving skills • Speaking skills • Writing skills



Logistics and Inventory Control: Individuals in this major are responsible for making sure other employees have the materials they need to complete a task efficiently, which often includes transporting raw materials to the production line, estimating the cost of materials and preparing finished products for shipment.

If you choose Logistics and Inventory Control as your career major, you may be a part of:

- Assessing appropriate equipment and staff needed for handling, storing and unloading materials
- Supplying plans that ensure availability of materials and products
- Loading and unloading trucks
- Coordinating supply chain management with other areas in the company, such as sales, marketing, finance, production and quality assurance
- Managing activities related to strategic or tactical purchasing, material requirements planning, inventory control, warehousing or receiving

Sample Careers

Associate's Degree or Less
Annual Salary Range
\$20,000-\$35,000

- Industrial Truck and Tractor Operator
- Shipping, Receiving or Traffic Clerk
- Dispatcher
- Production, Planning or Expediting Clerk

Bachelor's Degree
Annual Salary Range
\$35,000-\$50,000

- Production Controller
- Inventory Controller

Bachelor's Degree
Annual Salary Range
\$50,000-\$75,000+

- Cost Estimator
- Operations Research Analyst
- Logistician

NOTE: Salary may differ according to industry, county, region and state.

Career	Entry-Level Education	Annual Median Salary & Hourly Pay (2021)	Job Outlook (2021-31)	Responsibilities	Skills
Material Recording Clerks	High School Diploma or Equivalent	\$37,870/year \$18.21/hour	-1% (Decline)	<ul style="list-style-type: none"> • Keep track of and record all outgoing and incoming shipments and ensure they have been filled correctly • Scan barcodes with hand-held devices or use radiofrequency identification (RFID) scanners to keep track of inventory • Compute freight costs and prepare invoices for other parts of the organization • Move goods from the warehouse to the loading dock • Compile reports on various aspects of changes in production or inventory 	<ul style="list-style-type: none"> • Analytical skills • Clerical skills • Communication skills • Customer service • Organizational skills
Cargo and Freight Agents	High School Diploma or Equivalent	\$46,910/year \$23.28/hour	10% (Average)	<ul style="list-style-type: none"> • Determine shipping methods and routes from pick-up location to final destination • Coordinate transportation and logistics details with shipping and freight companies • Record information such as cargo amount, weight, dimensions and time of shipment • Prepare bills of lading, invoices and other required shipping documents • Estimate, negotiate and determine shipment costs and other related charges 	<ul style="list-style-type: none"> • Bookkeeping skills • Computer skills • Customer service skills • Organizational skills
Purchasing Managers, Buyers and Purchasing Agents	Bachelor's Degree	\$75,410/year \$36.26/hour	-4% (Decline)	<ul style="list-style-type: none"> • Evaluate suppliers based on price, quality and delivery speed • Negotiate contracts on behalf of the company • Analyze price proposals, financial reports and other information to determine reasonable prices • Maintain and review records of items bought, costs, deliveries, product performance and inventories • Meet with vendors to discuss defective or unacceptable goods or services and determine corrective action 	<ul style="list-style-type: none"> • Analytical skills • Decision making skills • Math skills • Negotiating skills
Logisticians	Bachelor's Degree	\$77,030/year \$37.03/hour	30% (Much Faster than Average)	<ul style="list-style-type: none"> • Develop business relationships with suppliers and customers • Direct the allocation of materials, supplies and finished products • Design strategies to minimize the cost or time required to move goods • Review the success of logistical functions and identify areas for improvement • Stay current on advances in logistics technology and incorporate new technologies into procedures 	<ul style="list-style-type: none"> • Communication skills • Critical thinking skills • Organizational skills • Problem solving skills



Health, Safety and Environmental Assurance: To ensure the safety and wellbeing of all employees, people who work in this major implement specific health and safety programs, policies and procedures; plan and implement safety issues in new production processes; and conduct investigations into environmental and safety issues.

If you choose Health, Safety and Environmental Assurance as your career major, you may be a part of:

- Compiling, analyzing and interpreting statistical data related to occupational illnesses and accidents
- Conducting or coordinating worker training in areas such as safety laws and regulations, hazardous condition monitoring and use of safety equipment
- Inspecting facilities, machinery and safety equipment to correct potential hazards and ensure safety regulation compliance
- Reporting or reviewing findings from accident investigations, facilities inspections or environmental testing

Sample Careers

Associate's Degree or Less

Annual Salary Range

\$35,000-\$45,000

- Safety Technician
- Health Physics Technician
- Hazardous Material Removal Worker
- Environmental Science Technician

Bachelor's Degree

Annual Salary Range

\$45,000-\$100,000+

- Health and Safety Representative
- Safety Team Leader
- Environmental Scientist
- Environmental Specialist

Career	Entry-Level Education	Annual Median Salary & Hourly Pay (2021)	Job Outlook (2021-31)	Responsibilities	Skills
Environmental Engineering Technicians	High School Diploma or Equivalent plus Certifications	\$48,390/year \$23.27/hour	8% (Average)	<ul style="list-style-type: none"> Set up, test, operate and modify equipment for preventing or cleaning up environmental pollution Collect, analyze and test samples for pollution Work to mitigate sources of environmental pollution Review technical documents to ensure completeness and conformance to requirements Arrange for the disposal of lead, asbestos and other hazardous materials 	<ul style="list-style-type: none"> Listening skills Monitoring skills Problem sensitivity Reading comprehension skills Teamwork
Health and Safety Engineers	Bachelor's Degree	\$99,040/year \$47.62/hour	6% (Average)	<ul style="list-style-type: none"> Inspect, test and evaluate workplace environments, equipment and practices to ensure they follow safety standards and government regulations Collect samples of potentially toxic materials for analysis by occupational health and safety specialists Demonstrate the correct use of safety equipment Investigate accidents to identify why they happened and how they might be prevented in the future 	<ul style="list-style-type: none"> Communication skills Detail oriented Problem solving skills Stamina Technical skills
Environmental Scientists and Specialists	Bachelor's Degree	\$76,530/year \$36.79/hour	8% (Average)	<ul style="list-style-type: none"> Review plans and specifications for new machinery or equipment to make sure it meets safety requirements Inspect facilities, machinery and safety equipment to identify and correct potential hazards Ensure that a building or product complies with health and safety regulations Review employee safety programs and recommend improvements Install safety devices on machinery or direct installation of these devices 	<ul style="list-style-type: none"> Creativity Deductive reasoning Problem sensitivity Problem-solving skills
Environmental Engineers	Bachelor's Degree	\$96,820/year \$46.55/hour	40% (Much Faster than Average)	<ul style="list-style-type: none"> Design projects leading to environmental protection, such as air pollution control systems and operations that convert waste to energy Obtain, update and maintain plans, permits and standard operating procedures Analyze scientific data and conduct quality-control checks Inspect industrial facilities to ensure compliance with environmental regulations Monitor progress of environmental improvement programs 	<ul style="list-style-type: none"> Communication skills Problem-solving skills Reading-comprehension skills Teamwork

PROFILE OF THE South Carolina Graduate

WORLD-CLASS KNOWLEDGE

Rigorous standards in language arts
and math for career and college
readiness

Multiple languages, science, technology,
engineering, mathematics (STEM), arts and
social sciences



WORLD-CLASS SKILLS

Creativity and innovation
Critical thinking and
problem solving

Collaboration and teamwork
Communication, information,
media and technology
Knowing how to learn

LIFE AND CAREER CHARACTERISTICS

Integrity • Self-direction • Global perspective • Perseverance • Work ethic • Interpersonal skills

© SCASA Superintendents' Roundtable

Codified by the South Carolina General Assembly in 2016

Adopted by: SC Arts Alliance, SC Arts in Basic Curriculum Steering Committee, SCASCD, SC Chamber of Commerce, SC Coalition for Math & Science, SC Commission on Higher Education, SC Council on Competitiveness, SC Education Oversight Committee, SC School Boards Association, SC State Board of Education, SC State Department of Education, TransformSC Schools and Districts



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