

MANUFACTURING EDITION

PATHWAYS TO SUCCESS

An education- and career-planning
guide for South Carolina students





Dear South Carolina Student,

“What do you want to be when you grow up?” You’ve heard it again and again, and if you’re like most people in school, you probably feel pretty lost. However, knowing what appeals to you or, better yet, what you want to do, can help you focus on those subjects and activities that will prepare you for the future.

But with so much to think about in life right now, and so many career directions to choose from, choosing a career pathway can be overwhelming. Even worse, what if you were to decide and then change your mind?

How would you like to know more about your options? This guide offers you realistic insight into various career clusters and how they might fit into the way you think and feel.

Pathways to Success can help you get started. It is a series of education- and career-planning guides designed to help you make informed, smart career decisions. You can use this information to eliminate options that aren’t attractive, so you can begin focusing on a career direction that is more appealing.

If you change your mind along the way, Pathways to Success can help you redirect your career plans, courses, and extracurricular activities.

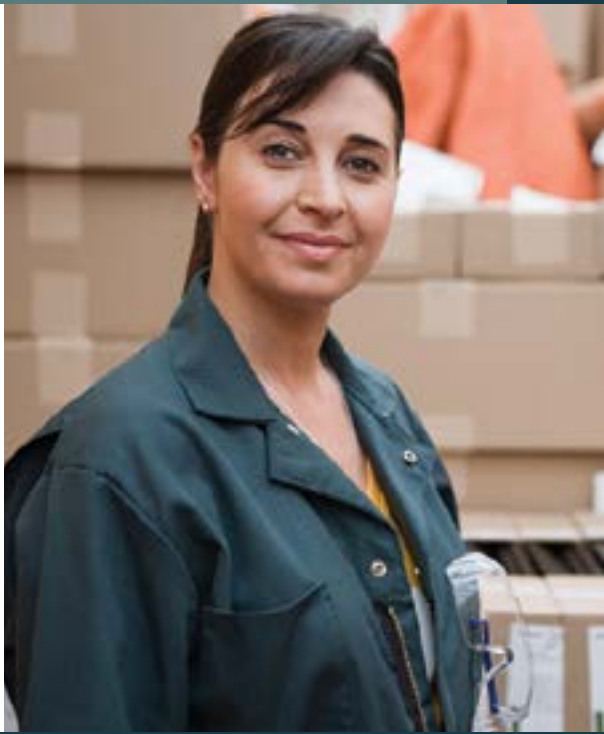
In South Carolina, there are 16 career clusters that you can explore. This issue of Pathways to Success introduces you to one of these clusters. The clusters correspond to different fields within the job market (business, healthcare, the arts, agriculture, manufacturing, etc.).

Each issue of Pathways to Success explains what it is like to work in one of the career clusters, what kinds of jobs are available, and what parts of the career cluster are growing fastest. It also spells out the specific ways to prepare yourself for an occupation: majors to choose in high school, what classes to take, opportunities to learn outside of class, and the kind of education and training you can pursue after high school.

Believe it or not, being in school gives you a great chance to explore all of your options. So go for it. Figure out just how you feel about certain subjects. Seek out those things that you feel good about. Then start preparing yourself so you will be able to do the things you like to do “when you grow up.”

Build a Career in the Manufacturing Industry

When it comes to a career in Manufacturing, it doesn’t get much better than South Carolina. Almost 5,000 Manufacturing and Manufacturing-related businesses are in the state in fields ranging from plastics to technology, and pharmaceuticals to minerals. In fact, 97% of all South Carolina’s total merchandise exports are manufactured goods. Read on to discover whether getting your hands on a Manufacturing career is right for you.



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ATTENTION:

Parents, Teachers, and Counselors: This Guide Is for You, Too.

This career cluster guide speaks to students about their education and career paths, but you play a critical role by providing guidance for their future. Read this guide and learn more about the Manufacturing cluster. Then, sit down and talk with your child or the student you are advising and help craft an Individual Graduation Plan, or IGP. An IGP is the beginning of a personal pathway to success (see “What is an IGP?” on page 6).

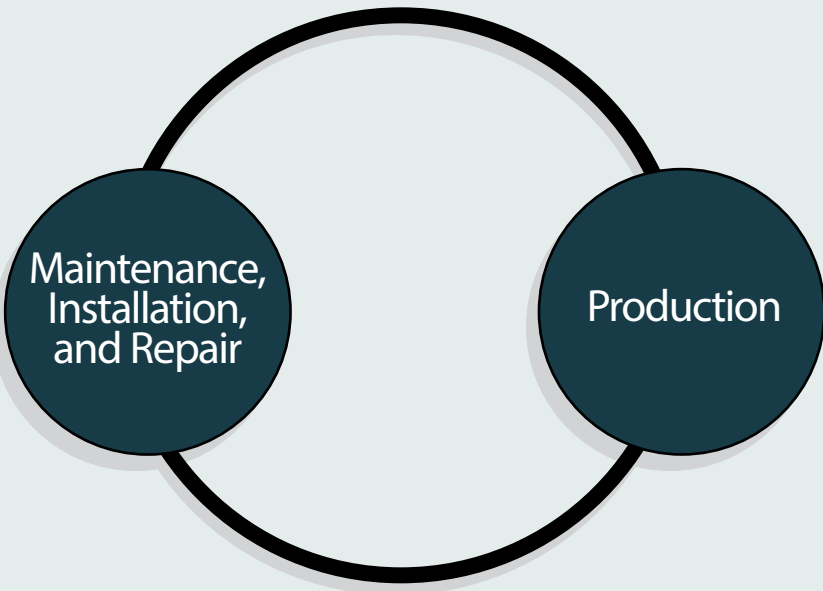


What Are Career Clusters and Majors?

Career clusters help you acquire the knowledge and skills you need to reach your personal career goals. They organize what you learn in school around specific professional fields such as Education and Training or Information Technology. Information Technology, for example, focuses on professions that require highly technical training, while Human Services emphasizes occupations that involve people skills. South Carolina recognizes these 16 career clusters offered at various schools across the state.

- Agriculture, Food, and Natural Resources
- Architecture and Construction
- Arts, A/V Technology, and Communications
- Business, Management, and Administration
- Education and Training
- Finance
- Government and Public Administration
- Health Science
- Hospitality and Tourism
- Human Services
- Information Technology
- Law, Public Safety, Corrections, and Security
- Manufacturing
- Marketing, Sales, and Service
- Science, Technology, Engineering, and Mathematics
- Transportation, Distribution, and Logistics

Majors Clustered Under Manufacturing



Each cluster consists of career majors, which are based on groups of professions that require similar talents, knowledge, and skills. For example, two majors fall within the Manufacturing cluster (see illustration above). Each major provides required courses, instructions, and experiences necessary to move toward employment in specific fields such as production, logistics, or environmental assurance either right after high school or after additional education in college, the military, or elsewhere.

A Model Career Cluster System

Career Awareness (Grades K-5)	Grades K–2 <ul style="list-style-type: none">• Students learn about different kinds of work.• Students are instructed in diversity and gender equity in the workplace.• Students learn about goal setting and decision making.• Students learn what it means to be a good worker.
	Grades 3–5 <ul style="list-style-type: none">• Students use career assessment instruments to identify occupations.• Students learn about occupations in the various career clusters.• Students get involved in career guidance classroom activities.
Career Exploration (Grades 6-8)	6th Grade <ul style="list-style-type: none">• Students begin career exploration activities, including identification of learning opportunities in the community.• Students take career assessment instruments.• Students identify jobs within the clusters requiring different levels of education.
	7th Grade <ul style="list-style-type: none">• Students identify the steps of the career decision-making process.• Students identify and explore sources of career information.• Students take career assessment instruments.• Students explore work-based learning activities including service learning, job shadowing, and mentoring.
	8th Grade <ul style="list-style-type: none">• Students pick a cluster of study that they are interested in exploring.• Students explore work-based learning activities including service learning, job shadowing, and mentoring.• Students meet with parents, counselors, teachers, guardians, and legal designees to develop both an academic and career portfolio consistent with their academic and career focus.• Students take career assessment instruments.
	9th Grade <ul style="list-style-type: none">• Students may declare majors and focus their elective choices in particular areas.*• Students review and update their IGPs.• Students take career assessment instruments.• Students explore work-based learning activities including service learning, job shadowing, and mentoring.
Career Preparation (Grades 9-Postsecondary)	10th Grade <ul style="list-style-type: none">• Students should declare a career major.*• Students review and update their IGPs.• Students take career assessment instruments.• Students explore work-based learning activities including service learning, job shadowing, and mentoring.
	11th Grade <ul style="list-style-type: none">• Students review and update their graduation plans, with particular attention to postsecondary goals.• Students take career assessment instruments.• Students explore work-based learning activities including service learning, job shadowing, and mentoring.• Students may change or modify their career majors.
	12th Grade <ul style="list-style-type: none">• Students complete requirements for their majors.• Students receive recognition for completion of career cluster majors at graduation.• Students take career assessment instruments.• Students explore work-based learning activities including service learning, job shadowing, and mentoring.• Students may change or modify their career majors.
	Postsecondary <ul style="list-style-type: none">• Students follow aligned career cluster pathways to a two- or four-year college, the military, other postsecondary education or training, or employment.• Students obtain rewarding entry-level employment within their chosen clusters.• Students continue to refine career choices throughout their lifetimes of learning.

* Students are encouraged to review their IGPs and modify or change this focus throughout their secondary school careers with the guidance of educators and parents.

Seven Steps to Success



Choosing a career in which you'll feel happy both financially and mentally is important.

Your future career can be fun, or it can make you totally miserable, depending on whether you choose one that fits your unique personality, interests, goals, and abilities. Planning to be a nurse, for example, makes no sense if you can't stand the sight of blood. Forget being an engineer if you aren't going to take on advanced math. And if you live to be outdoors, opt out of a profession that keeps you cooped up in an office all day. The truth is, earning a living for about 40 years is a lot more rewarding—financially and otherwise—if you find the profession that fits you perfectly.

The search for your perfect profession starts with creating an Individual Graduation Plan, often called an IGP, to guide you through high school (see “What is an IGP?” on page 6). Every South Carolina student is required to create an IGP, but don't think of it as a hassle. Instead, look at it as a chance to explore your interests and options and to start working toward your personal dream—whether it's to be a movie star or a minister, a CEO or a chef, an entrepreneur, or an engineer.

Here's a step-by-step guide to creating your own Individual Graduation Plan.

■ Step 1: Complete Assessments

Start putting together your IGP by determining your strengths and weaknesses, what you love (or hate) to do with your time, and your hopes and dreams in life. To find the answers to these and other questions, take advantage of career assessment tools such as Holland's Self-Directed Search, ASVAB (Armed Services Vocational Aptitude Battery), and the Kuder Interest Inventory available through your school and online (see “What is an IGP?” on page 6).



■ Step 2: Research Your Career Opportunities

After learning more about yourself, put together a list of careers you might want to research. Get the facts about what each possible profession pays,



how many jobs in those professions are available in South Carolina (both now and in the future), and what kind of education you'll need to break into each of them. (For profiles of 25 career options in Manufacturing, see page 8). Use the career information resources available through your school's library and the Internet, including SCOIS, O*NET, and COIN (see “Resource

Roundup” on page 21). Go beyond the statistics, though, to get the inside story on what those who work in occupations on your list really do every day. Start by contacting professional associations and visiting Web sites, then arrange personal interviews and job shadowing.

n Step 3: Explore Your Education Options



Use your list of possible professions to investigate your education options in high school and beyond (see “Outsmart the Competition: Other Students” on page 18). Identify both two-year and four-year colleges with programs that best fit your career goals. In the same way, find out about obtaining associate's degrees at two-year technical colleges with programs in Manufacturing. Also, research opportunities for Manufacturing training in the military. Then look at the clusters, majors, and courses offered in high school as well as special programs such as co-op education and dual-credit courses. Learn about academic requirements and tests you may have to take to graduate and get into college, including PACT, PSAT, PLAN, SAT, ACT, and WorkKeys. Also, explore extracurricular activities (see “Learn by Doing” on page 16) related to your list of possible professions, including sports, community service groups, band, clubs, and student organizations such as SC SkillsUSA, Business Professionals of America (BPA), and DECA.

n Step 4: Talk About Your Options With Parents and Counselors

Assessments and research are essential, but input from your parents (or guardians), counselors, and teachers can also help as you narrow your career and education choices. Talk with them about what you are learning as you are assessed—they can help you further identify your strengths, opportunities, and interests. Tell them about your hopes and dreams. Discuss with them career options five, 10, or 20 years from now. Ask them to help with your research by providing resources or using their contacts to set up career exploration experiences such as job shadowing and internships. Time with your guidance staff person may be limited, so make the most of it. Come in with clear and well-researched ideas about your future, and ask what he or she can do to help you get where you want to go in life.

n Step 5: Make Your Choices and Document Your Decisions



Now that you are armed with valuable research and good advice from people you trust, it's time to make some decisions. Ask your counselor what format your IGP should follow—it likely will include most of the information shown in “What is an IGP?” on page 6. Select your career objective, cluster, and major, and write them down on your IGP. Fill in a tentative schedule for your high school years. Add to your plan lists of the out-of-class and work experiences you want to pursue and your goal after high school—college, the military, employment, or another option. It's also smart to create a career portfolio, which is a file of material related to the education and career choices in your IGP. This portfolio might include items such as a resume, samples of your schoolwork, and research and assessment information. Once you have documented your decisions, save your IGP and career portfolio as your school directs.

n Step 6: Review and Revise Your IGP Each Year

A good IGP is frequently updated. It expands and changes as you go through high school. At least once at the end of each year, go back to your IGP and revise it as needed. Ask yourself if your decisions are still sound or if you've changed your mind about your career objective or plans after high school. Be realistic, but don't feel locked in to the choices you made earlier. Switching your cluster or major as you learn more about your interests and options in life is okay. Some direction—even if it changes—is better than no direction at all. Use this annual review of your plan to make choices that are intentional, not accidental, as you grow and change.

n Step 7: Graduate and Move On to Additional Education or Employment

The goal of an IGP is to give you a clear path to high school graduation, but that's not the end of your road to success. The plan you created will carry you on to college, the military, an apprenticeship, other education or training, or directly into the job market. You likely will continue to evaluate, research, discuss, and refine your career choices after high school and throughout your life.

What is an IGP?

An Individual Graduation Plan (IGP) is like a road map to your future. If you stay on course, you'll reach your destination—graduation—with all the courses, skills, and experience you need to take your education or career to the next level. Here's what a basic IGP includes:

Information such as your name and school.

Your chosen career cluster is a field of study such as Education and Training or Business, Management, and Administration on which you plan to focus in high school and beyond. South Carolina recognizes 16 career clusters (see page 2), although local schools and districts may offer different clusters. This guide is an introduction to the Manufacturing cluster.

Your plan for what to do after high school—get an associate's or bachelor's degree, enter the armed forces, seek industry certification, find employment, or pursue other options. Be specific—it's just a goal you can change later if needed.

A grade-nine-through-twelve outline of classes you should take, including core academic classes required for graduation and electives. Fill in the specific classes your school offers.

Your school may make this type of basic IGP part of your career portfolio—a file or folder that also may contain such information as results of your career-interest assessments, examples of your schoolwork, your scores from standardized tests, and records of your work experiences.

Individual Graduation Plan

Name: Star Jones
School: West High School
Cluster: Manufacturing
Major: Maintenance, Installation, and Repair
Postsecondary Goal: Bachelor's degree in Electrical Engineering from a four-year college

Required Courses			
English 1	English 2	English 3	English 4
Math/In the Technology 1	Algebra 1	Algebra 2	Algebra 3
Physical Science	Biology 1	Physics	Chemistry
Social Studies	Computer Science	U.S. History	Government/Economics
Physical Education	Foreign Language	Machine Tool Technology	Electronics
Introductory to Manufacturing	Mechanics/Integrated Technology	Welding	Steel Metal Foundation

Co-curricular Activities: Business Professionals of America (BPA)
Work-Based Learning Opportunities: Internship, co-op education, job shadowing

Out-of-class learning opportunities you want to pursue, such as student organizations or work experiences.

Your chosen career major, a field such as Manufacturing Production, in which you plan to work when you enter the job market.

Who Says Manufacturing Jobs Are Dull?

All too often the perception of Manufacturing is that of workers on an assembly line or cars being assembled by robots or even that more and more manufacturing and production is being sent overseas. Well, here are some interesting facts:

- By itself, the U.S. manufacturing industry would be the world's eighth largest economy.
- The U.S. receives more patent applications than any other country.
- In South Carolina alone manufacturing accounts for more than \$24.9 billion each year.

The truth is, there are a lot of jobs in Manufacturing that require highly-skilled and trained people. Just ask the more than 30,000 people employed in manufacturing in South Carolina.

Maybe you'd like to work as a laser systems technician. Laser systems technicians usually work in modern, well-equipped laboratories or assembly areas and build, test, and repair laser equipment and systems. And, they must have the knowledge to work with electronic subassemblies, gas-filled plasma tubes, crystal rods, and semiconductor chips among other high-tech materials and equipment. So, if you think you might enjoy working with your hands on delicate electronic and optical equipment you can visit www.laserinstitute.org to learn more.

Or maybe you'd like to be a chemical engineer and turn scientific discoveries into marketable products. Chemical engineers usually specialize in areas such as food, pharmaceuticals, plastics, or synthetic textiles. They also conduct research to develop new Manufacturing processes and design equipment for safe storage and transportation. Most chemical engineers work in various areas in manufacturing plants including laboratories and research rooms or administrative offices, while others with advanced degrees are employed in research and teaching positions for colleges and universities.

Even more common industries such as plastics, rubber, and textiles can offer exciting career opportunities in their respective fields. All you have to do is look.

When it comes to a career in Manufacturing, you have choices that include everything from hoist and wench operators to biomedical equipment technicians and environmental specialists. In fact, there are literally dozens of career paths you can follow. The goal is to choose a career you think will make you happy. If you're good with your hands, are a problem solver, have technical skills, or are interested in health and the environment, Manufacturing could be a great way to go.

According to the National Association of Manufacturers (NAM), Manufacturing contributes more than 60% of all U.S. exports totaling about \$50 billion per month. Plus, wages and benefits are about 25% higher than in non-Manufacturing jobs. Add that 81% of manufacturing representatives who responded to an NAM Skills Survey said they could not find qualified people to fill open positions, and you can see why a career in manufacturing is a worthy pursuit.

There are more than 120 manufacturing-related companies listed on the South Carolina Manufacturing Alliance (SCMA) site (www.myscma.com) with links to Web sites.

Many Manufacturing jobs are so specialized, they require high levels of skills and training.



Quick Quiz

Answer "yes" or "no" to these questions to see if Manufacturing is the right career cluster for you.

1. I can repair a broken item, such as a watch or radio.
2. I'm skilled at working with my hands.
3. I'm good at taking apart an item and then putting it back together.
4. I like operating different kinds of tools to complete a job.
5. I'm willing to lift heavy objects in my job.
6. Changing raw materials into useful products, such as making paper from wood, sounds exciting to me.
7. I'd like to build furniture or buildings.
8. I'd like to work outdoors.

Totals: "Yes" _____ "No" _____

If you answered "yes" to five or more of the questions, then you may have what it takes to make it in Manufacturing.

Source: SCOIS (Coin Career) Assessment Tests



25 Career Choices in Manufacturing

About This Chart

This chart is a sampling of 25 of the more than 100 occupations that fall within the Manufacturing sector of the South Carolina job market. For more information about any Manufacturing occupation, check out the South Carolina Occupational Information System (SCOIS). This electronic database is packed with valuable information on careers, colleges, scholarships, and more. SCOIS is available in local schools and at more than 600 other locations throughout South Carolina. Here are explanations for the abbreviations and symbols used in this chart.

Education Requirement Abbreviations

- C — 12- or 18-month certificate
- AD — Two-year associate’s degree
- AP — Advanced Placement
- BD — Four-year bachelor’s degree
- HS — High school diploma or GED
- MA — Master’s degree
- NA — Information not available or item does not apply
- OJT — On-the-job training
- DD — Doctorate degree

Source: www.salary.com

Occupation	SC Salary	Job Growth ¹	Education Required ²	Career Readiness Certificate Level ³	Description
Nuclear Quality Control Inspector	\$88,900	8.7%	AD	gold	Inspects machinery and working materials produced at manufacturing companies during power plant construction and during nuclear facility operations.
Chemical Engineer	\$77,770	-5.8%	BD, MA, DD	gold	Designs chemical plant equipment and devises processes for manufacturing chemicals and products such as gasoline, plastics, detergents, cement, and paper.
Ceramic Engineer	\$75,890	2.6%	BD, MA, DD	gold	Designs and supervises the construction of ceramic plants and manufactures ceramic products such as pottery, glassware, and electronic components.
Electrical and Electronics Engineer	\$73,080	8.1%	BD, MA, DD	gold	Designs, develops, tests, and supervises the manufacture of electrical and electronic equipment.
Industrial Engineer	\$64,600	-6.5%	BD, MA, DD	gold	Determines the most effective ways for an organization to use the basic factors of production.
Purchasing Agent	\$57,500	4.4%	AD, BD	gold	Coordinates the activities that are involved with procuring goods and services, such as raw materials, equipment, tools, parts, and supplies.
Electronics Technician	\$44,640	8.3%	OJT, HS, AD	gold	Designs and creates electronic equipment and machines using plans drawn by engineers.
Engineering Technician	\$44,630	6.8%	AD	gold	Applies the principles of science, engineering, and mathematics to solve problems in research and development, manufacturing, sales, and customer service.
Laser Technician	\$41,250	16.5%	AD	gold	Operates, tests, repairs, maintains, and constructs laser systems or systems that incorporate lasers.
Telecommunications Installer and Repairer	\$41,120	18.1%	BD	gold	Sets up and maintains telecommunications equipment to transmit communication signals via computer, television, radio, and telephone.
Millwright	\$41,110	6.0%	OJT, HS, AD	silver	Installs machinery and equipment according to layout plans, blueprints, and other drawings in an industrial establishment.
Robotics Technician	\$41,110	6.0%	OJT, HS, AD	gold	Installs, services, troubleshoots, maintains, and repairs robots and robot systems.
Boilermaker	\$38,790	9.1%	OJT, HS	gold	Builds, assembles, installs, tests, and repairs metal structures such as boilers, tanks, furnaces, smoke stacks, and heat exchangers.
Tool and Die Maker	\$38,700	-9.2%	OJT, HS	gold	Produces tools, dies, and guiding and holding devices that are used to produce a variety of products.
Computer-Control Tool Programmer	\$37,700	-8.4%	OJT, HS, AD	gold	Plans and writes programs, using computer languages and practical knowledge of machine tool operation, for computer numerically controlled machine tools.
Supervisor	\$37,690	15.7%	OJT, HS	gold	Directs the activities of other employees and insures that equipment and materials are used properly and efficiently.
Science Technician	\$36,590	4.7%	AD, BD	gold	Uses the principles of science and mathematics to solve issues in research and development, production, oil and gas exploration, sales, and customer service.
Production Coordinator	\$36,060	2.6%	AD	silver	Prepares production schedules and coordinates and expedites the flow of work within or between departments of manufacturing plants.
Biomedical Equipment Technician	\$35,800	NA	AD	gold	Maintains and repairs a vast array of sophisticated electronic equipment used in the health care field.
Painting/Coating Machine Operator	\$32,190	-10.4%	OJT, HS	silver	Uses painting and coating machinery and equipment to apply finishes to machines and other manufactured products.
Welder	\$31,740	1.7%	OJT, HS	silver	Joins metal parts using heat and/or pressure to form a permanent bond.
Precision Assembler	\$30,940	-5.1%	OJT, HS	silver	Puts together the parts of manufactured articles, which requires precision and a high degree of accuracy.
Computer-Control Machine Tool Operator	\$30,110	-9.7%	OJT, HS, AD	gold	Sets up and operates single or multi-purpose computer numerically controlled (CNC) machines to perform according to specifications.
Photoengraver and Lithographer	\$28,020	-1.6%	HS, AD	silver	Gets materials ready for printing using such techniques as electronic imaging and computerized typesetting.
Quality Control Inspector	\$28,020	-1.5%	OJT, HS, AD	silver	Inspects a wide variety of products to insure compliance with contract specifications.

1 The expected percentage increase or decline in the number of positions in the profession in South Carolina through 2008.
2 The minimum educational attainment required to enter the profession; occupations may have different entry-level jobs for those with different degrees.

3 The South Carolina Career Readiness Certificate demonstrates to employers that you have the skills necessary to be successful in your chosen occupation. For more information on the CRC in South Carolina go to www.WorkReadySC.org.

Choose a Major

Start training for a future in Manufacturing.

Academic Foundations

Successful careers in manufacturing are built on solid foundations of academic basics.

- **Science:** New and innovative products come to market as new technology is constantly being developed. Basic scientific knowledge underlies every successful Manufacturing effort.
- **Math:** From accurate, minute measurements to economies of scale and production efficiencies and the careful budgeting of an ongoing project, math is essential to Manufacturing.
- **English:** Manufacturing is a group enterprise that proceeds smoothly only if coordinated through precise written and oral communications.
- **Social Studies/History:** A global industry brings together people with widely varying backgrounds and heritages. To make a melting-pot operation work, it helps if everyone understands his or her coworkers' cultures and histories.
- **Modern or Classical Language:** Language study increases people's abilities to understand and communicate with people from other cultures and stimulates their abilities to communicate in their own language. Both skills can boost the performance of multicultural manufacturing teams.
- **Arts:** Believe it or not, creativity plays a part in Manufacturing. Manufacturing companies are among those who produce innovative and creative equipment and products. It's why four-year colleges and universities now require an arts credit for admission, so be sure to sign up.

In the world of work, one size does not fit all. As your career unfolds, it may turn out that choices you made earlier aren't right for you in the long run. That's why it's really important to always know what your options are. If Manufacturing interests you, then look more closely at all the ways you can prepare for work in this cluster.

The Career Major Maps, beginning on page 12, are maps to help guide your way through the Manufacturing cluster and give you a good idea of the choices you face. It's pretty clear-cut, really. To be successful in particular jobs, you have to prepare in particular ways. The career majors will help you. (See "What Are Career Clusters and Majors?" on page 2).

The Career Major Maps include sample high school schedules, but your school may offer different programs and classes. The maps also include information about extracurricular activities, educational options after high school, and jobs for which each major might prepare you. Use these maps to create your IGP and to chart your course into the career of your choice. In Manufacturing, there are many different majors to choose from. Each corresponds to a different set of jobs in the manufacturing industry in South Carolina.* For example, if you choose Mechanical Engineering as a major, you can follow that pathway to programs in Manufacturing offered at two- or four-year colleges and then into a job in the manufacturing business after graduation. And, there are even great jobs available right out of high school. Generally, you need to take four electives in your major area to graduate with a high school major. In Manufacturing, there are two different majors to choose from:

- Production (page 12)
- Maintenance, Installation, and Repair (page 13)



Revisit Your Choices

If you find yourself unhappy with where a career pathway is taking you, it's no big problem. Because you have a reliable set of career road maps, you can always pull over, take a break, and reconsider your earlier decisions. As you move along through your high school career, you'll have plenty of opportunities to review and change your choices. Sample different majors and opt for the one that best suits your tastes.

*The U.S. Department of Education lists majors under Manufacturing but uses different names. Local schools and districts may offer fewer career clusters and majors, clusters and majors that are organized differently, or clusters and majors with alternative names.

10 Highest-Paying Manufacturing Professions

	Occupation	Salary
1.	Nuclear Engineer	\$88,900
2.	Orthotist and Prosthetist	\$83,620
3.	Chemical Engineer	\$77,770
4.	Ceramic Engineer	\$75,890
5.	Aerospace Engineer	\$73,500
6.	Electrical and Electronics Engineer	\$73,080
7.	Marine Engineer and Architect	\$72,960
8.	Mining and Geological Engineer	\$70,500
9.	Mechanical Engineer	\$68,200
10.	Industrial Hygienist	\$66,020

Based on annual mean salary in South Carolina.
Source: SCOIS

10 Fastest-Growing Manufacturing Professions

	Occupation	Job Growth
1.	Pest Controller	24.1%
2.	Locksmith	21.5%
3.	Structural Metal Worker	20.3%
4.	Elevator Installer/Repairer	20.3%
5.	Maintenance Supervisor	19.6%
6.	Security and Fire Alarm System Installer	18.9%
7.	Telecommunications Equipment Repairer	18.1%
8.	Telecommunications Installer and Repairer	18.1%
9.	Telephone Installer and Repairer	18.1%
10.	Energy Conservation and Use Technician	17.7%

Based on expected growth in percentage of jobs available between 2001 and 2008 in South Carolina. Source: SCOIS



Career Major Map: Production

Operating specialized equipment in the highly skilled areas of medical equipment manufacturing or fiber optic manufacturing requires employees who can understand complex equipment and procedures, but who also have the interpersonal skills to efficiently work in “clean room” environments. From line workers in pharmaceutical plants to process engineers, these are the people that drive our economy.

Required Core for Graduation	Sample Core Choices			
	For additional college entrance requirements, refer to the college of your choice.			
	9	10	11	12
English* Four Units Required	English 1	English 2	English 3	English 4
Math* Four Units Required	Algebra 1 or MathfortheTechnologies1	Geometry or MathfortheTechnologies2	Algebra 2 or MathfortheTechnologies3	Pre-Calculus or MathfortheTechnologies4
Science* Four Units Required	Physical Science	Biology or Applied Biology	Chemistry or Chemistry for the Technologies	Physics or Physics for the Technologies
Social Studies Three Units Required	Global Studies 1 or World Geography	Global Studies 2 or Social Studies Elective or World History	U.S. History	Economics/Government
Additional State Requirements	Physical Education or JROTC (one unit) Computer Science (one unit) Electives (seven units) Pass High School Assessment CTE or Modern or Classical Language (one unit) Art (one unit)			

Courses for Major (Minimum of four credits required)	Complementary Course Work	Extended Learning Opportunity Options Related to Major
Introduction to Manufacturing Mechatronics Integrated Technologies Machine Tool Technology Welding Electronics Sheet Metal Fabrication	Home Systems Technology Electronics CADD OSHA 10-hour course Electricity Welding Modern or Classical Language	Career Mentoring Shadowing Internship Cooperative Education Senior Project SkillsUSA

Professional Opportunities Upon Graduation		
High School Diploma Industrial Machinery Mechanic Machine Tool Operator Automated Manufacturing Technician Millwright Welder Tool and Die Maker	Additional Training to 2-year Degree Instrument Control Technician Automation Technician Electronics Technician Electrical Equipment Installer Production Manager	4-year Degree & Higher Mechanical Engineer Electrical Engineer Industrial Engineer Electronics Engineer Design Engineer Manufacturing Engineer

*Course selection will depend on satisfying prerequisites.

Career Major Map: Maintenance, Installation, and Repair

Those who pursue careers in this cluster are typically drawn to machinery and gadgets of all kinds. They enjoy taking things apart to see how they work, then putting them back together. With manufacturing becoming increasingly automated, the demand for workers who can work with specialized equipment is growing. Many people put their skills to work as engineers who develop the machinery necessary to make manufacturing work.

Required Core for Graduation	Sample Core Choices			
	For additional college entrance requirements, refer to the college of your choice.			
	9	10	11	12
English* Four Units Required	English 1	English 2	English 3	English 4
Math* Four Units Required	Algebra 1 or MathfortheTechnologies1	Geometry or MathfortheTechnologies2	Algebra 2 or MathfortheTechnologies3	Pre-Calculus or MathfortheTechnologies4
Science* Four Units Required	Physical Science	Biology or Applied Biology	Chemistry or Chemistry for the Technologies	Physics or Physics for the Technologies
Social Studies Three Units Required	Global Studies 1 or World Geography	Global Studies 2 or Social Studies Elective or World History	U.S. History	Economics/Government
Additional State Requirements	Physical Education or JROTC (one unit) Computer Science (one unit) Electives (seven units) Pass High School Assessment CTE or Modern or Classical Language (one unit) Art (one unit)			

Courses for Major (Minimum of four credits required)	Complementary Course Work	Extended Learning Opportunity Options Related to Major
Introduction to Manufacturing Mechatronics Integrated Technologies Machine Tool Technology Welding Electronics Sheet Metal Fabrication	Home Systems Technology Electronics CADD OSHA 10-hour course Electricity Welding Modern or Classical Language	Career Mentoring Shadowing Internship Cooperative Education Senior Project SkillsUSA

Professional Opportunities Upon Graduation		
High School Diploma Communication System Installer Computer Maintenance Technician Electrical Equipment Installer Industrial Machinery Mechanic Industrial Maintenance Technician Machine Tool Operator	Additional Training to 2-year Degree Industrial Maintenance Technician Industrial Maintenance Electrician Instrument Control Technician Automation Technician Welder Electronics Technician	4-year Degree & Higher Mechanical Engineer Electrical Engineer Industrial Engineer Electronics Engineer

*Course selection will depend on satisfying prerequisites.

Mechatronics Integrated Technologies (MIT)

Automation, Information Technology, Electronics, Advanced Manufacturing, and Maintenance



Mechatronics refers to a flexible, multi-technological approach in the integration of Mechanical Engineering, Computer Engineering, Electronics, and Information Sciences. Mechatronics is essential in the design of intelligent products and is in high demand according to South Carolina manufacturers.

MIT is a technician training program for the automation industry utilizing principles of physics, math, and the integration of automation principles.

Students completing this program may choose a pathway directly to a career, articulate to a technical college, or attend an engineering program. Mechatronics Integrated Technologies (MIT) curriculum includes areas of study in mechanical, advanced electrical systems, and information technology systems in an integrated and comprehensive training program.

The Mechatronics and automation industry includes high tech systems such as computers, networking, advanced manufacturing, mechanical systems, electronics, automation, and robotics. Students entering Mechatronics in high school will be better prepared to enter engineering or engineering technology postsecondary programs after graduation. Since students receive real world training on actual industry equipment, some may choose to enter internships with manufacturing companies before graduation from high school and head straight to high paying careers upon graduation. High school students presently receive national industry credentials before graduation when enrolled in MIT programs, which employers indicate is highly desirable.



Higher Education Is Affordable

A variety of grants, scholarships, and student loans are available to help you pay for college.

Grants

Federal Programs

- Academic Competitiveness Grant Program: Grants for Pell Grant recipients who completed a rigorous secondary school program.
- Federal Pell Grant: Up to \$4,310 per year, based on the student's need as determined by the FAFSA.
- Federal Supplemental Educational Opportunity Grant: Grants of up to \$4,000 a year for students with exceptional financial need.

State Programs

- Call Me MISTER: This program recruits, trains, certifies, and secures employment for African-American males as elementary teachers in SC's public schools. To learn more, visit www.callmemister.clemson.edu.
- Lottery Tuition Assistance: This program provides tuition assistance to SC residents attending two-year public or private institutions.
- SC Need Based Grant: For SC's neediest students, up to \$2,500 is available annually.
- SC Tuition Grant: A need-based grant for eligible South Carolinians who choose to attend full-time at one of SC's 21 participating independent (private) colleges. Up to \$3,200 is available annually. For additional information, visit www.sctuitiongrants.com.

Scholarships

- HOPE Scholarship: A merit-based scholarship for SC residents attending a four-year institution in SC and who do not qualify for the LIFE or Palmetto Fellows Scholarships. \$2,800 is available for freshmen only.
- LIFE Scholarship: A merit-based scholarship for SC residents attending a SC institution. Up to \$5,000 is available per year, which can increase to \$7,500 per year, for sophomores, juniors, and seniors with math or science-related majors.
- Palmetto Fellows Scholarship: A program recognizing the most academically talented high school seniors in SC. Up to \$6,700 is available during the freshman year. Up to \$7,500 is available per year during the sophomore, junior, and senior years, increasing to \$10,000 per year for those with math or science-related majors.
- SC Teaching Fellows Program: Designed to recruit talented high school seniors into the teaching profession. Up to \$6,000 available annually.

For additional information regarding state scholarships, contact the SC Commission on Higher Education at 803-737-2260, or visit www.che.sc.gov.

SOUTH CAROLINA
Student Loan

For additional loan information, visit the Web site at www.scstudentloan.org or call 1-800-347-2752.

Student Loans

SC Student Loan is South Carolina's only nonprofit student loan provider. Established by the South Carolina General Assembly in 1973 for the sole purpose of helping students attend college, SC Student Loan offers affordable student loan programs with convenient repayment terms and exceptional borrower benefits.

SC Student Loan offers the following federal, state, and private education loan programs:

- Federal Stafford Loan: The largest source of financial aid, Stafford Loans are low interest rate loans (currently 6.8%) made to the student.
- Federal PLUS Loan: For parents of undergraduate students, this loan is currently at an 8.5% fixed interest rate. Payments can be postponed while the student is enrolled.
- Federal Grad PLUS Loan: This loan is for students attending graduate or professional school.
- Federal Consolidation Loan: Allows borrowers who are in repayment or their grace period to combine eligible loans into a single loan with a fixed interest rate and an extended repayment period.
- SC Teachers Loan: A program to encourage talented students to enter the teaching profession. It has a forgiveness feature for recipients who teach in a designated geographic area or subject area in SC.
- Palmetto Assistance Loan (PAL): Various private loans are available, for students or parents, with a variable interest rate.



Learn by Doing

After all, you wouldn't want an industrial engineer with no experience building a manufacturing plant, right?

Beyond-the-Books Benefits

Blending course work with outside career-related opportunities enables you to:

- get a hands-on look at possible career choices;
- fine-tune your focus on the future;
- make more informed choices;
- create an IGP that is effective and efficient;;
- graduate with the skills and experience colleges and employers want;
- earn college credits and even a paycheck before you graduate;
- build your career portfolio and resume;
- jumpstart your career and/or college education.

No one stepping into a new job is expected to have learned all that needs to be known about the job from a book. Some skills can be learned only from experience. And since learning by doing comes naturally in the Manufacturing cluster, it's easy to find real world experience. However, as occupations have become more complex, relying on on-the-job training is less effective than it once was. Classwork is an essential ingredient in a successful career and always will be.

n Job Shadowing

This option is so popular, there's even a National Job Shadowing day on Groundhog Day – get it? Each February 2, students spend the day following, watching, and participating in their chosen career fields (or ones they find interesting) as they shadow workers in those professions. The idea is to experience real-world applications to lessons learned in the classroom. See www.jobshadow.org for more information, or ask your parents, teachers, and guidance counselor to help you find a shadowing opportunity any time of the year.

n Virtual Learning

In recent years, the educational community has taken advantage of the Internet as a means of reaching out to students who may not have access to the hands-on resources they need to pursue their academic or career interests. Web-based virtual learning programs can provide you with the online academic and career planning tools you need. Use a search engine to look for online education and career development opportunities associated with any career, or visit www.virtualjobshadow.com.

n Internships

Internships give you the opportunity to experience what being an employee in a career field is really like. Internships typically involve a relationship between a student and a relevant business in which the student works part- or full-time for a time period of a few weeks up to a year. These learning experiences provide insight into the workplace as well as show you what kinds of skills, education, or training is necessary to succeed. Some students are so successful during an internship it leads to a job offer.

n Cooperative Learning

Quality work spent in the pursuit of a career can count toward your graduation requirements. Cooperative learning describes how educators combine learning outside the classroom with existing curriculum requirements.

n Apprenticeships

For many, career apprenticeships are the first step toward certification in a variety of careers. They allow workers to coordinate on-the-job training with classroom learning to master specific skills associated with a particular career.

n Mentoring

In schools, students have teachers. In the real world, students have mentors. This long-term relationship with an industry professional gives you firsthand insider information that's important for career success. Mentors provide a perspective that can only be acquired through experience.

n Get a Job

Many high school students have after-school or summer jobs to earn money. For students interested in careers in Manufacturing, earning spending cash fits in nicely with career preparation. Get in touch with one of the many manufacturing companies throughout South Carolina and see what they have to offer. A list of more than 120 companies can be seen at www.myscma.com. Manufacturing jobs are readily available to young people, and many successful careers begin as after-school jobs.

In some cases, your job can earn you credit toward high school graduation. Many manufacturing businesses actively recruit motivated students to sign up for internships that qualify for "dual" academic credits—where you receive college credit for secondary school courses or credits. If your job does not offer this option, talk with your guidance counselor and employer about crafting an individualized internship agreement. You may end your summer job with money in your pocket, valuable new skills, and contacts as well as credit toward graduation.

n Get Certified

In some cases, you can even turn your part-time job into a valuable certification that you take with you—along with your diploma—when you graduate from high school. Many manufacturing companies offer training and certification programs for both full- and part-time employees.



Student Organizations

- **SkillsUSA** – With a national membership totaling more than a quarter of a million high school and college students, teachers, and professional members, SkillsUSA has 13,000 chapters in the United States and the territories. SkillsUSA recognizes that technical skills are only a starting point to success. Character development, lifelong education, and pride in the dignity of work are qualities that count for students enrolled in technical and skilled training programs. SkillsUSA sponsors local, state, and national competitions designed to demonstrate technical skills in areas such as plumbing, welding, precision machining technology, carpentry, electricity, and masonry. More important, the organization helps students develop sound leadership skills, a good work ethic, and communications skills crucial to advancement within the construction industry. www.skillsusa.org
- **DECA** – DECA is an Association of Marketing Students. The organization has more than 5,000 chapters across the nation. DECA works to develop leadership and business skills in students as well as provide opportunities to explore career fields within the marketing industry. www.deca.org
- **Future Business Leaders of America (FBLA)** – Bringing business and education together in a positive working relationship, FBLA provides students with the skills needed to successfully compete in the job market, pursue further education, and manage personal skills. There are nearly 250,000 members nationally. www.fbla.org
- **Technology Student Association (TSA)** – TSA is an organization composed of middle and high school students with a passion to learn about technology. Students in the organization not only understand the value of learning to live in a technical world, but treasure the challenge of thriving in this 21st century environment. Members of the association compete in a myriad of events ranging from public speaking to Web design. The skills obtained through TSA are constantly used throughout a student's life. www.tsaweb.org

Outsmart the Competition: Other Students

Be happy.
South Carolina has
the training you'll
need for success
in Manufacturing.

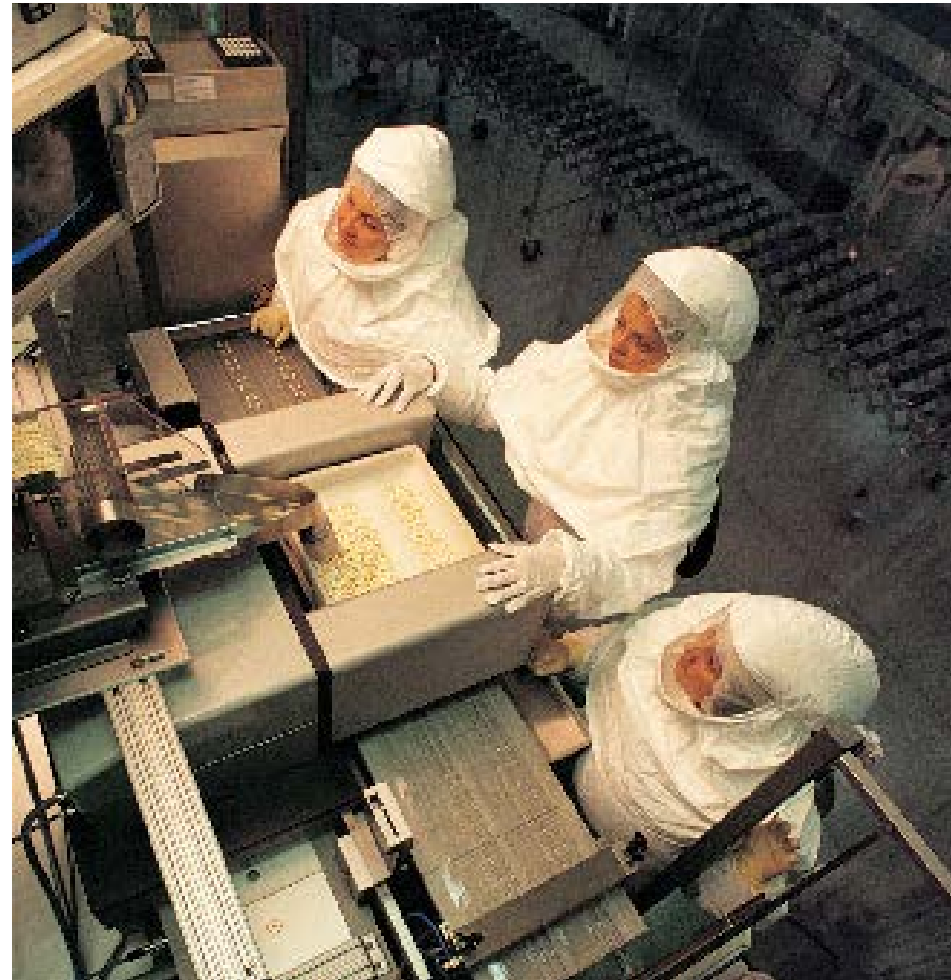
College Connections



Every South Carolina two- and four-year college has a Web site that includes information about admission requirements, majors, fees, financial aid, internships, and scholarship opportunities.

You can find the Web site for any South Carolina public, private, or technical college through one of these sites:

- South Carolina Public Colleges/Universities
www.state.sc.us/edu/univcoll.html
- South Carolina Technical Colleges
www.scteched.tec.sc.us
- South Carolina Independent Colleges/Universities
www.scicu.org



Manufacturing is a highly competitive industry that continues to grow in South Carolina. So naturally, having the proper education and training can earn you the position you desire most and help you be successful. In fact, the state's recent average manufacturing wage was more than \$42,000. Here are some sources of education after high school that can help you build a career in Manufacturing:

n Two-Year and Technical Colleges

On-the-job training is widespread in Manufacturing. Companies often offer such training to teach highly technical skills or to help advance careers. Real-life experience is so important many college programs partner with manufacturers to offer students the opportunity to get real world experience while still in school.

Students are generally paid for their work and companies may rotate students through various jobs, assign research projects, or set up job shadow days, in which students have the opportunity to spend entire workdays on the job.

n The Fast Track

For many students interested in Manufacturing careers, two-year degrees, on-site training, and certification programs are the most popular form of preparation. The best ways to learn more about these options?

- Talk with your guidance counselor.
- Get in touch with a local technical or two-year college.
- Contact a manufacturing company that specializes in a field in which you are interested.

n Not-So-Basic Training in the Military

With hundreds of thousands of personnel stationed all over the globe and servicemen and servicewomen preparing millions of meals every day, the U.S. military offers a very appealing option for on-the-job training in Manufacturing. One of the best learning opportunities offered by the Army is its Hospital Food Specialist Program. Job training for a hospital food specialist consists of nine weeks of basic training followed by nine to 14 weeks of advanced individual training. Hospital food specialists gain skills in three of today's hottest job markets: Manufacturing, Hospitality and Tourism, and Health Science. Through the Army's Partnership for Youth Success (PaYS) program, soldiers who leave the Army have access to priority hiring programs with top employers in both of these fields, including the Hospital Corporation of America, Travel Centers of America, and many others. Learn more about training options in the service at www.goarmy.com (Army), www.navy.com (Navy), www.airforce.com (Air Force), and www.marines.com (Marines), and www.uscg.mil (Coast Guard).



Money For School

If you're worried about finding money for training and education, quit worrying and get to work. Assistance in the form of grants, loans, and scholarships is available at every step of your career and is not just for the college-bound. With worker shortages looming, many companies not only provide on-the-job training but also pay for you to master new skills at local colleges, technical schools, or other training programs. Trade associations and unions also provide financial incentives for you to learn new skills.

You won't know if you qualify for aid unless you apply, so don't be shy about asking for help from your high school counselor or financial aid officers at the schools you would like to attend. Start your online search at www.finaid.org. The site lets you explore the basics of scholarships, grants, loans, savings plans, and tax incentives. This site also lists trade- and industry-specific scholarships.

In South Carolina, the Commission on Higher Education offers assistance through a variety of avenues, including LIFE Scholarships, the South Carolina HOPE Scholarship, and the Palmetto Fellows Scholarship. The Lottery Tuition Assistance Program for students in technical schools is administered through the state's technical college system, and the Tuition Grants Program provides need-based aid.

More than \$80 billion dollars a year in federal aid is available nationwide for students enrolled in certification programs, degree and non-degree programs, trade schools, career and technical schools, colleges, and universities. Apply online by completing the "Free Application for Federal Student Aid" (FAFSA) at www.fafsa.ed.gov, or ask your guidance counselor or college or technical school admissions officer for a hard copy of the form.

Federal Work-Study funds are available through technical schools and colleges in South Carolina. If you're planning a military career, the Reserve Officer Training Corps (ROTC) will pay you to attend school. Military veterans also qualify for college aid through the GI Bill, and vets can receive aid through On-the-Job Training (OJT) and Apprenticeship Programs (APR), as well.



Core Requirements for Graduation

High School Graduation

Subjects	Units Required
English/Language Arts	4
Mathematics	4
Science	3
U.S. History and Constitution	1
Economics	0.5
U.S. Government	0.5
Other Social Studies	1
Physical Education or Junior ROTC	1
Computer Science	1
Modern or Classical Language or Career and Technology Education	1
Electives	7
Total *	24
* Must pass the exit examination.	

State Certificate

Subjects	Units Required
English/Language Arts	4
Mathematics	4
Science	3
U.S. History and Constitution	1
Economics	0.5
U.S. Government	0.5
Other Social Studies	1
Physical Education or Junior ROTC	1
Computer Science	1
Modern or Classical Language or Career and Technology Education	1
Electives	7
Total *	24
* Must have failed to meet the standard on all subtests of the exit examination.	

College Entrance

Subjects	Units Required
English/Language Arts	4
Grammar and Composition	2
English Literature	1
American Literature	1
Mathematics	4
Algebra 1 and 2	2
Geometry	1
Pre-Calculus	1
Modern or Classical Language	2
Laboratory Science Biology, Chemistry, or Physics	3
Social Sciences U.S. History, Economics, and Government	3
Electives	1
Physical Education/ROTC	1
Arts	1
Total	19

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Resource Roundup

Click your way to more career, educational, and scholarship resources by using the Internet. Here are some useful Web sites to get you started:

Manufacturing Web Sites

- National Association of Manufacturers, www.nam.org
- South Carolina Manufacturers Alliance, www.myscma.com
- South Carolina Manufacturing Extension Partnership, www.scmep.org
- College of Engineering and Science, www.ces.clemson.edu

Search the Internet for other professional organizations related to Manufacturing careers.

Education and Career Planning Web Sites

Inside South Carolina

- Career Guidance Model, www.careerguidancemodel.org
- South Carolina Chamber of Commerce, www.scchamber.net
- South Carolina Commission on Higher Education, www.che400.state.sc.us
- South Carolina Employment Security Commission, www.sces.org
- South Carolina Higher Education Tuition Grants Commission, www.sctuitiongrants.com
- South Carolina Independent Colleges and Universities, www.scicu.org
- South Carolina Occupational Information System, www.scois.net
- South Carolina Public Colleges and Universities, www.state.sc.us/edu/univcoll.html
- South Carolina SkillsUSA, www.scskillsusa.org
- South Carolina Technical College System, www.sctechsystem.com
- WorkKeys, www.workreadysc.org

Outside South Carolina

- America's Career Resource Network Association, www.acrna.net
- Career Communications, Inc., www.carcom.com
- Armed Services Vocational Aptitude Battery (ASVAB), www.todaysmilitary.com/app/tm/nextsteps/asvab
- Career Interests Game, career.missouri.edu/students/explore/thecareerinterestsgame.php
- Career Key, www.careerkey.org
- Coin Career College System, community.coin3.com
- College Board, www.collegeboard.com
- Holland's Self-Directed Search, www.self-directed-search.com
- Kuder, www.sc.kuder.com
- Mapping Your Future, www.mapping-your-future.org
- National Career Development Association, www.ncda.org
- O*NET Online, online.onetcenter.org
- Occupational Outlook Handbook, www.bls.gov/oco
- The Princeton Review, www.review.com
- Salary Information, www.salary.com

* Web site addresses were correct at time of publication but may have changed. If an address is no longer valid, please use an Internet search engine to locate the resource.

Note: Local South Carolina schools and districts may choose to use fewer career clusters, clusters that are organized differently, or clusters with alternative names.

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Find more information on Manufacturing education and career planning.



Career Guidance Information Sources

Check out these comprehensive sources of career and education information, which are available through your school or public libraries:

SCOIS (South Carolina Occupational Information System)— www.scois.net. An electronic database of information about careers, salaries, job requirements, educational options, scholarships, and more.

O*NET (Occupational Information Network)— online.onetcenter.org. A national occupational information database that helps students make informed decisions about education, training, career choices, and work.

COIN (Coin Career Guidance System)— community.coin3.com. A comprehensive software program with career and college planning information, especially for South Carolina students.

WorkKeys— www.workreadysc.org. A comprehensive resource for information about the South Carolina Career Readiness Certificate – how and where to qualify, as well as its value to students and the community.

Kuder— sc.kuder.com. A comprehensive online college and career planning system with links to government and educational information and organizations.



Knowledge. Pass it on.

Education: It's the passing of knowledge, skills, and values from one generation to the next. So where will the next generation learn their ABCs? Or how to design sustainable buildings? Or to master foreign languages, like Spanish and Mandarin Chinese, so they can compete in a global economy? They learn from educators — people with knowledge and experience in every walk of life who make the time to share their knowledge. They learn from people like you.

Learn more at: www.cerra.org.



General Information

Job-Seekers

Employers

WorkKeys Administrators

Economic Developers

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(888) 717-9461 • www.w-win.com