2022 – 2023

PROGRAM GUIDE FOR:

MANUFACTURING CLUSTER

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CAREER AND TECHNICAL EDUCATION
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Manufacturing Cluster Program Guides

The Manufacturing cluster provides the knowledge and skills to equip students for careers in additive manufacturing, industrial maintenance, electronics, manufacturing, precision machining, and robotics. These courses include significant technical depth and engineering concepts and terminology. The Manufacturing cluster provides a safe and appropriate setting for student exploration and achievement. Students gain knowledge and skills through an active, structured, and stimulating environment coordinated with simulated workplace learning experiences. The Manufacturing cluster learning environment utilizes a variety of physical space to stimulate development of effective cognitive and psychomotor skills. Students experience a wide range of hands-on activities based on authentic representations of expectations found in the workplace. Theory and concepts are taught in proportion to the need for strong application opportunities with emphasis on timely learning experiences that facilitate the transition to skills attainment. Safety, proper tool use, and adherence to procedures are integral components for all student learning experiences.

**Courses highlighted in yellow are shared with other clusters. See "Shared Courses" table on page 5 for additional details.

Career Pathway Program	**Additive Manufacturing** **(Must teach three courses from this program list within two years)** Additive Manufacturing is based upon Computer-Aided-Design and 3-D Printing. This program provides students with the knowledge of Introduction, Intermediate, and Advanced Drafting Design Technology, Three-Dimensional Solid Modeling and Engineering Applications and the skill to be successful in the Mechanical and Technical Design fields.		
Course Number	**Career Pathway Program Courses**	**Career Readiness Indicator (CRI)**	**Workforce Careers**
21106G1033	Advanced Drafting Design	• Alabama Certified Worker (Ready to Work) • Autodesk- AutoCAD Certified User • Autodesk- Inventor Certified User • Autodesk Fusion 360 Certified User • SolidEdge Certified Associate • SolidWorks Associate	• CAD Designer • Mechanical Designer • Technical Designer
13997G1003	Career Pathway Project in Manufacturing		
13997G1001	CTE Lab in Manufacturing		
21002G1001	Engineering Design Applications		
21106G1023	Intermediate Drafting Design		
21106G1013	Introduction to Drafting Design		
21004G1001	Introduction to Engineering Design		
13001G1000	Introduction to Manufacturing		
17049G1000	Safety and Health Regulations		
21107G1012	Three-Dimensional Solid Modeling I		
21107G1022	Three-Dimensional Solid Modeling II		

Career Pathway Program	**Electronics Program** **(Must teach three courses from this program list within two years)** The electronics program covers a variety of topics including: Electrical Theory; Electronic Components; Soldering-Desoldering and Tools; Block Diagrams-Schematics-Wiring Diagrams; Cabling; Power Supplies; Test Equipment and Measurements; Safety Precautions; Mathematics and Formulas; Electronic Circuits; Series and Parallel; Amplifiers; Interfacing of Electronics Products, Digital Concepts and Circuitry; Computer Electronics; Computer Applications; Audio & Video Systems; Optical Electronics; Basic Telecommunications; and Technician Work Procedures. Students will be prepared to earn entry level credentials recognized by the Electronics Technicians Association (ETA).		
Course Number	**Career Pathway Program Courses**	**Career Readiness Indicator (CRI)**	**Workforce Careers**
17106G1002	Alternating Current	• Alabama Certified Worker (Ready to Work) • Electronics Technicians Association - Student Electronics Technician • Electronics Technicians Association - Basic DC • Electronics Technicians Association - Basic AC • Electronics Technicians Association - Basic Analog • Electronics Technicians Association - Basic Digital • Electronics Technicians Association – Comprehensive • NCCER Electronic Systems Technician, Electronics • NCCER Core (module 6 is an elective and not required for CRI) • MSSC – Certified Production Technician (CPT) (Each module will count as a CRI)	• Electronics Repair Technician • Electronics Installer
13997G1003	Career Pathway Project in Manufacturing		
13997G1001	CTE Lab in Manufacturing		
17104G1003	Digital Electronics		
17106G1001	Direct Current		
20101G1033	Electronics and Control Systems		
21009G1005	Embedded Arduino Controls		
13001G1000	Introduction to Manufacturing		
21009G1001	Introduction to Robotics		
21009G1002	Robotics Applications		
17049G1000	Safety and Health Regulations		
17106G1003	Semiconductors		
17109G1000	Telecommunications Cabling		

Career Pathway Program	Industrial Maintenance Electrical & Instrumentation **(Must teach three courses from this program list within two years)** Industrial maintenance is divided into two distinct pathways, electrical and instrumentation and mechanical. Industrial maintenance technicians are needed in every industry that uses machinery, from automotive assembly plants to computer manufacturers. Not only do they repair and maintain electrical instruments and equipment, but they also install and dismantle them. Every time a new appliance leaves a factory, or a new car rolls off the line, a skilled industrial maintenance technician played a role in producing it. This program aligns with NCCER standards and covers topics such as Fasteners and Anchors, Process Mathematics, Pneumatic Controls, Oxyfuel Cutting, Introduction to Piping Components, and Laser Alignment.		
Course Number	**Career Pathway Program Courses**	**Career Readiness Indicator (CRI)**	**Workforce Careers**
13997G1003	Career Pathway Project in Manufacturing	• Alabama Certified Worker (Ready to Work) • NCCER Core (module 6 is an elective and not required for CRI) • NCCER Industrial Maintenance E & I Level 1 • FANUC CERT- Handling Tool Operations and Programming • MSSC – Certified Production Technician (CPT) (Each module will count as a CRI)	• Industrial Maintenance Electrical Repair Technician • Industrial Maintenance Instrumentation Repair Technician
13997G1001	CTE Lab in Manufacturing		
13303G1001	Industrial Maintenance – Electrical & Instrumentation I		
13303G1002	Industrial Maintenance – Electrical & Instrumentation II		
13303G1003	Industrial Maintenance – Electrical & Instrumentation III		
13001G1000	Introduction to Manufacturing		
17049G1000	Safety and Health Regulations		

Career Pathway Program	Industrial Maintenance Mechanical **(Must teach three courses from this program list within two years)** Industrial maintenance is divided into two distinct pathways, electrical and instrumentation and mechanical. Industrial maintenance technicians are needed in every industry that uses machinery, from automotive assembly plants to computer manufacturers. Not only do they repair and maintain electrical instruments and equipment, but they also install and dismantle them. Every time a new appliance leaves a factory, or a new car rolls off the line, a skilled industrial maintenance technician played a role in producing it. This program aligns with NCCER standards and covers topics such as Fasteners and Anchors, Process Mathematics, Pneumatic Controls, Oxyfuel Cutting, Introduction to Piping Components, and Laser Alignment.		
Course Number	**Career Pathway Program Courses**	**Career Readiness Indicator (CRI)**	**Workforce Careers**
13997G1003	Career Pathway Project in Manufacturing	• Alabama Certified Worker (Ready to Work) • NCCER Core (module 6 is an elective and not required for CRI) • NCCER Industrial Maintenance Mechanic Level 1 • FANUC CERT- Handling Tool Operations and Programming • MSSC – Certified Production Technician (CPT) (Each module will count as a CRI)	• Pipefitting Technician • Industrial Maintenance Mechanical Repair Technician
13997G1001	CTE Lab in Manufacturing		
13303G1004	Industrial Maintenance - Mechanical I		
13303G1005	Industrial Maintenance - Mechanical II		
13303G1006	Industrial Maintenance - Mechanical III		
13001G1000	Introduction to Manufacturing		
17049G1000	Safety and Health Regulations		

Career Pathway Program	Modern Manufacturing **(Must teach three courses from this program list within two years)** Modern Manufacturing is designed to prepare students for entry level positions in manufacturing. These courses align with MSSC and NCCER standards which includes modular courses for: Safety, Quality, Production and Maintenance.		
Course Number	**Career Pathway Program Courses**	**Career Readiness Indicator (CRI)**	**Workforce Careers**
13997G1003	Career Pathway Project in Manufacturing	• Alabama Certified Worker (Ready to Work) • FANUC CERT- Handling Tool Operations and Programming • NCCER Core (module 6 is an elective and not required for CRI) • MSSC – Certified Production Technician (CPT) (Each module will count as a CRI)	• Manufacturing Operations Technician • Manufacturing Operations Manager
13997G1001	CTE Lab in Manufacturing		
13001G1000	Introduction to Manufacturing		
13002G1013	Manufacturing I - Safety		
13002G1023	Manufacturing II - Quality		
13002G1033	Manufacturing III - Production		
13002G1043	Manufacturing IV - Maintenance		
17049G1000	Safety and Health Regulations		

Career Pathway Program	Precision Machining Program **(Must teach three courses from this program list within two years)** Precision machinists set up and operate a variety of machine tools to produce precision parts and instruments. The precision machining curriculum includes necessary skills for students to fabricate, modify, or repair mechanical instruments.		
Course Number	**Career Pathway Program Courses**	**Career Readiness Indicator (CRI)**	**Workforce Careers**
13997G1003	Career Pathway Project in Manufacturing	• Alabama Certified Worker (Ready to Work) • NIMS Level 1 Measurement, Materials & Safety • NIMS Level 1 Job Planning, Benchwork & Layout • NIMS Level 1 Manual Milling Skills • NIMS Level 1 Turning Operations: Turning Between Centers • NIMS Level 1 Turning Operations: Turning Chucking Skills • NIMS Level 1 Grinding Skills • NIMS Level 1 Drill Press Skills • NIMS Level 1 CNC Turning: Programming Setup & Operations • NIMS Level 1 CNC Milling: Programming Setup & Operations • NIMS Level 1 Turning: Operations • NIMS Level 1 Milling Operations • MSSC – Certified Production Technician (CPT) (Each module will count as a CRI)	• Precision Machinist • CNC Machinist
13203G1004	Computer-Aided Design and Computer-Aided Manufacturing I		
13203G1005	Computer-Aided Design and Computer-Aided Manufacturing II		
13203G1006	Computer Numerical Control (CNC) I		
13203G1007	Computer Numerical Control (CNC) II		
13204G1001	Coordinate Measuring Machine		
13997G1001	CTE Lab in Manufacturing		
13204G1006	Drill Press		
13204G1004	Intermediate Lathe and Bench Work		
13204G1002	Introduction to Lathe		
13001G1000	Introduction to Manufacturing		
13203G1001	Introduction to Precision Machining		
13203G1008	Milling and Surface Grinder I		
13203G1009	Milling and Surface Grinder II		
17049G1000	Safety and Health Regulations		

Career Pathway Program	Robotics and Automated Manufacturing Program **(Must teach three courses from this program list within two years)** The Robotics and Automated Manufacturing program covers a variety of topics including: Computer Automation, Design, and Production, as well as Introduction to Robotics, Robotics Application, Electronics and Control Systems. Students will be prepared to earn entry level credentials recognized by the Electronics Technicians Association (ETA), MSSC, and NCCER.		
Course Number	**Career Pathway Program Courses**	**Career Readiness Indicator (CRI)**	**Workforce Careers**
13997G1003	Career Pathway Project in Manufacturing	• Alabama Certified Worker (Ready to Work) • Autodesk Inventor Certified User • Autodesk-AutoCAD Certified User • Electronics Technicians Association - Student Electronics Technician • Electronics Technicians Association - Basic DC • Electronics Technicians Association - Basic AC • Electronics Technicians Association - Basic Analog • Electronics Technicians Association - Basic Digital • Electronics Technicians Association – Comprehensive • NCCER Electronic Systems Technician, Electronics • NCCER Core (module 6 is an elective and not required for CRI) • MSSC – Certified Production Technician (CPT) (Each module will count as a CRI) • SolidEdge Certified Associate • SolidWorks Associate	• Controls Engineer • Industrial Maintenance • Electronic Technician • Programmable Logic Controller Technician • Automation Technician
13997G1001	CTE Lab in Manufacturing		
21010G1001	Computer Integrated Automation		
21010G1002	Computer Integrated Design		
21010G1003	Computer Integrated Production		
20101G1033	Electronics and Control Systems		
13001G1000	Introduction to Manufacturing		
21009G1001	Introduction to Robotics		
21009G1002	Robotics Application		
21010G1002	Robotics and Automation		
17049G1000	Safety and Health Regulations		

2022-2023 Subject and Personnel Codes
Manufacturing Cluster

Course Number	Course Name	Course Number	Course Name
21106G1033	Advanced Drafting Design	21106G1023	Intermediate Drafting Design
17106G1002	Alternating Current	13204G1004	Intermediate Lathe and Bench Work
13997G1003	Career Pathway Project in Manufacturing	21106G1013	Introduction to Drafting Design
13203G1004	Computer-Aided Design and Computer-Aided Manufacturing I	21004G1001	Introduction to Engineering Design
13203G1005	Computer-Aided Design and Computer-Aided Manufacturing II	13204G1002	Introduction to Lathe
21010G1001	Computer Integrated Automation	13001G1000	Introduction to Manufacturing
21010G1002	Computer Integrated Design	13203G1001	Introduction to Precision Machining
21010G1003	Computer Integrated Production	21009G1001	Introduction to Robotics
13203G1006	Computer Numerical Control (CNC) I	13002G1013	Manufacturing I - Safety
13203G1007	Computer Numerical Control (CNC) II	13002G1023	Manufacturing II - Quality
13204G1001	Coordinate Measuring Machine	13002G1033	Manufacturing III - Production
13997G1001	CTE Lab in Manufacturing	13002G1043	Manufacturing IV - Maintenance
17104G1003	Digital Electronics	13203G1008	Milling and Surface Grinder I
17106G1001	Direct Current	13203G1009	Milling and Surface Grinder II
13204G1006	Drill Press	21009G1004	Robotics and Automation
20101G1033	Electronics and Control Systems	21009G1002	Robotics Applications
21009G1005	Embedded Arduino Controls	17049G1000	Safety and Health Regulations
21002G1001	Engineering Design Applications	17106G1003	Semiconductors
13303G1001	Industrial Maintenance – Electrical & Instrumentation I	17109G1000	Telecommunications Cabling
13303G1002	Industrial Maintenance – Electrical & Instrumentation II	21107G1012	Three-Dimensional Solid Modeling I
13303G1003	Industrial Maintenance – Electrical & Instrumentation III	21107G1022	Three-Dimensional Solid Modeling II
13303G1004	Industrial Maintenance - Mechanical I		
13303G1005	Industrial Maintenance - Mechanical II		
13303G1006	Industrial Maintenance - Mechanical III		

Shared Courses			
Course Number	**Course Name**	**Cluster(s)**	**Required Year to Implement COS**
21106G1033	Advanced Drafting Design	Architecture and Construction	2022-2023
17106G1002	Alternating Current	Information Technology	2022-2023
17106G1001	Direct Current	Information Technology	2022-2023
20101G1033	Electronics and Control Systems	Architecture and Construction	2022-2023
21106G1023	Intermediate Drafting Design	Architecture and Construction	2022-2023
21106G1013	Introduction to Drafting Design	Architecture and Construction	2022-2023
17049G1000	Safety and Health Regulations	Architecture and Construction Transportation, Distribution and Logistics	2022-2023
21107G1012	Three-Dimensional Solid Modeling I	Architecture and Construction	2022-2023
21107G1022	Three-Dimensional Solid Modeling II	Architecture and Construction	2022-2023

General Note: Course descriptions and content standards for most courses are located on the Alabama Department of Education website at: https://www.alabamaachieves.org/career-and-technical-education/cte-courses-of-study/.