

CAREER CLUSTER™: MANUFACTURING
**NM Job Council's 13 Economic Sectors Alignment: Manufacturing and Visitor
 Driven Industry**

Pathways and related Programs of Study in this career cluster address careers in planning, managing and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.

The Pathways for this Career Cluster™ are:

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

| Program Learning Outcomes from the NASDCTE Common Career Technical Core for the Manufacturing Career Cluster: | |
|--|--|
| 1. | Evaluate the nature and scope of the Manufacturing Career Cluster and the role of manufacturing in society and in the economy. |
| 2. | Analyze and summarize how manufacturing businesses improve performance. |
| 3. | Comply with federal, state and local regulations to ensure worker safety and health and environmental work practices. |
| 4. | Describe career opportunities and means to achieve those opportunities in each of the Manufacturing Career Pathways. |
| 5. | Describe government policies and industry standards that apply to manufacturing. |
| 6. | Demonstrate workplace knowledge and skills common to manufacturing. |

THE CERTIFICATIONS LISTED BELOW ARISE FROM INTERVIEWS, WEBINARS, AND FOCUS GROUPS WITH SECONDARY AND POST SECONDARY EDUCATORS AS WELL AS INPUT FROM INDUSTRY PARTNERS AND REPRESENTATIVES. THE NEXT STEP FOR VALIDATION IS LABOR MARKET DATA AND THE ECONOMIC NEEDS OF BOTH THE STATE OF NEW MEXICO AND THE REGIONS.

| Workforce Certification: |
|---------------------------------|
| NCCER Basic Core AWS-SENS |
| Welding Technician |
| NCCER HVAC Excellence |
| S/p2 Valvoline career tech |
| NCCER Industrial Maintenance |
| NCCER Sheet Metal |

Below are the POS's developed by the statewide stakeholders who participated in the development process.

Health, Safety and Environmental Assurance: Employees in Health, Safety and Environmental Assurance ensure that the equipment is being used safely in the workplace; plan for safety in new production processes; conduct health, safety and/or environmental incident and hazard investigations; conduct preventive health, safety and/or environmental incident and hazard inspections; and implement health, safety and/or environmental programs, projects, policies or procedures. They may train workers in health, safety and/or environmental issues and provide event documentation.

Program Learning Outcomes from the NASDCTE Common Career Technical Core for HEALTH, SAFETY AND ENVIRONMENTAL ASSURANCE CAREER PATHWAY:

Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.

| | |
|----|--|
| 1. | Demonstrate the safe use of manufacturing equipment. |
| 2. | Develop safety plans for production processes that meet health, safety and environmental standards. |
| 3. | Demonstrate a safety inspection process to assure a healthy and safe manufacturing environment. |
| 4. | Evaluate a system of health, safety and/or environmental programs, projects, policies or procedures to determine compliance. |
| 5. | Evaluate continuous improvement protocols and techniques in health, safety and/or environmental practices. |
| 6. | Conduct job safety and health analysis for manufacturing jobs, equipment and processes. |
| 7. | Develop the components of a training program based on environmental health and safety regulations. |

PROGRAM OF STUDIES COURSE SEQUENCE FOR HEALTH, SAFETY AND ENVIRONMENTAL ASSURANCE CAREER PATHWAY:

| | 9 th Grade | 10 th Grade | 11 th Grade | 12 th Grade |
|---|----------------------------------|---------------------------------|--|--|
| Career and Technical Courses and/or Degree Major Courses as Dual Credit | 1605 Diversified Occupations | 1654 Manufacturing For Tomorrow | 1624 Manufacturing Systems | <i>Has to be developed by a post secondary institution</i> |
| Suggestions for Enrichment to POS | 1614 Industrial Safety First Aid | 473 Building Maintenance | 873 MESA 152 Agricultural Structures and Construction | Dual Credit: Applications in Manufacturing Technology |

| Program Learning Outcomes Matrix FOR HEALTH, SAFETY AND ENVIRONMENTAL ASSURANCE CAREER PATHWAY: | | | | | | | | |
|---|--|---------------------------|---|---|---|---|---|---|
| <i>Note: each dot represents the understanding that the student taking that course would have the best opportunity to know and be able to do the CCTC knowledge and skill standards listed above.</i> | | | | | | | | |
| Courses in the POS | | Program Learning Outcomes | | | | | | |
| STARS No. | Course Title | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1605 | Diversified Occupations | | | | | | | |
| 1654 | Manufacturing For Tomorrow | | | | | | | |
| 1624 | Manufacturing Systems | | | | | | | |
| 1614 | Industrial Safety First Aid | | | | | | | |
| 473 | Building Maintenance | X | X | X | | | | |
| 873 | MESA | X | X | | | X | | v |
| 152 | Agricultural Structures and Construction | X | X | X | X | | | |
| 2503 | Community Protection | | X | X | | | | |

| STARS No. | Course Descriptions: |
|-----------|--|
| 1605 | Diversified Occupations - Recommended for Students Grades 9 - 12 - Course helps students enter the work force through career exploration, job search and application, and by developing positive work attitudes and work related skills. Career planning and selection, money management, communication skills, interpersonal business relationships and behavior, and personal responsibility are typical topics covered in diversified occupations courses. Employment may be a required component of this course, or students may be required to enroll concurrently in a work experience course. |
| 302 | General Computer Applications - Designed for students with an interest in exploring the uses of the personal computer, General Computer Applications courses provide experience in the proper use of previously written software packages. A wide range of applications is explored, including (but not limited to) word processing, spreadsheet, graphics, and database programs. Electronic mail and desktop publishing may also be included. Exercises and problems may be from any field, or may be defined by the student(s). |
| 1654 | Manufacturing For Tomorrow - Grades 9 -12 - Ford Partnership for Advance Studies course that addresses 4 manufacturing modules: From Concept to Consumer, Closing the Environmental Loop, Planning for Efficiency, Ensuring Quality. |
| 1624 | Manufacturing Systems - Recommended for Students Grades 9 - 12 - Course introduces students in a general fashion to the manner in which materials are processed and transformed using various methods. Processing techniques covered may include casting, forming, separating, assembling, and finishing. The courses may also include an overview of management techniques in planning, organizing, and controlling various segments of the manufacturing process, including design, engineering, production, and marketing. Students may organize a "company" and create products for sale. |

Programs of Study and Certifications Working Document

| STARS No. | Course Descriptions: |
|-----------|---|
| 1614 | Industrial Safety First Aid - Recommended for Students Grades 9 - 12 - Course provides instruction in safe operating procedures related to various trades, as well as more general training in emergency first aid and CPR. Course topics may include the importance of standard operation procedures, agencies and regulations related to occupational safety and hazard prevention, and the dangers of particular materials. |
| 473 | Building Maintenance - Recommended for Students Grades 10 - 12 - Courses train students to maintain commercial, industrial, and residential buildings and homes. Instruction is provided in the basic maintenance and repair of air conditioning, heating, plumbing, electrical, and other mechanical systems. Topics covered may include identification and safe use of hand and power tools; installing and repairing floor coverings, walls, and ceilings; installing and repairing doors, windows, screens, and cabinets; applying finishes to prepared surfaces; and repairing roofs, masonry, plumbing, and electrical systems. |
| 873 | Math Engineering Science Achievement (MESA) - Course incorporates hands on, real world math activities into a variety of practical scientific situations by using experimental skills and processes to reach solutions. Students are challenged to discover hidden principles of math, science, engineering, and technology and apply these principles through the use of critical thinking, problem solving, and decision making by using theoretical frameworks, and by developing prototypes and working models. |
| 152 | Agricultural Structures and Construction - Recommended for Students Grades 10 - 12 - Topics include surveying, concrete and masonry, plumbing, drafting, carpentry and electrical wiring; use of bids and billing information to develop a complete materials list and project cost estimate; use of measurement and layout tools. Procedures for safe operations in the agricultural mechanics laboratory are included in this course. |
| 2503 | Community Protection - Course provides students with information regarding the personnel and agencies concerned with protection of the home, city, state, and nation. Topics may include civil defense and disaster preparedness; crime prevention; pollution control; fire prevention and control; legal and social systems and principles; and public health. These topics may be explored as a community resident and citizen using these services, or as one interested in pursuing a career in public service. |

Logistics and Inventory Control: People with careers in Logistics and Inventory Control work with an inventory of raw materials and finished parts. They move raw materials to the production line, unload trucks with raw materials, wrap pallets of finished products for shipment, and communicate with traffic managers.

| Program Learning Outcomes from the NASDCTE Common Career Technical Core FOR LOGISTICS AND INVENTORY CONTROL CAREER PATHWAY: | |
|--|---|
| <i>Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.</i> | |
| 1. | Demonstrate positive customer service skills in regard to logistics and inventory control issues. |
| 2. | Demonstrate proper handling of products and materials in a manufacturing facility. |
| 3. | Develop a safety inspection process to assure a healthy and safe manufacturing facility. |
| 4. | Manage inventory using logistics and control processes and procedures. |

| POS Course Sequence for Logistics and Inventory Control Career Pathway: | | | | |
|--|------------------------------|---------------------------------|----------------------------|--|
| | 9 th Grade | 10 th Grade | 11 th Grade | 12 th Grade |
| Career and Technical Courses and/or Degree Major Courses as Dual Credit | 1605 Diversified Occupations | 1654 Manufacturing For Tomorrow | 1624 Manufacturing Systems | <i>Has to be developed by a post secondary institution</i> |
| Suggestions for Enrichment to POS | | | | Dual Credit: Applications in Manufacturing Technology |

| Program Learning Outcomes Matrix for LOGISTICS AND INVENTORY CONTROL Career Pathway: | | | | | |
|---|----------------------------|---------------------------|---|---|---|
| <i>Note: each dot represents the understanding that the student taking that course would have the best opportunity to know and be able to do the CCTC knowledge and skill standards listed above.</i> | | | | | |
| Courses in the POS | | Program Learning Outcomes | | | |
| STARS No. | Course Title | 1 | 2 | 3 | 4 |
| 1605 | Diversified Occupations | | | | |
| 1654 | Manufacturing For Tomorrow | | | | |
| 1624 | Manufacturing Systems | | | | |

Programs of Study and Certifications Working Document

| STARS No. | Course Descriptions: |
|-----------|--|
| 1605 | Diversified Occupations - Recommended for Students Grades 9 - 12 - Course helps students enter the work force through career exploration, job search and application, and by developing positive work attitudes and work related skills. Career planning and selection, money management, communication skills, interpersonal business relationships and behavior, and personal responsibility are typical topics covered in diversified occupations courses. Employment may be a required component of this course, or students may be required to enroll concurrently in a work experience course. |
| 1654 | Manufacturing For Tomorrow - Grades 9 -12 - Ford Partnership for Advance Studies course that addresses 4 manufacturing modules: From Concept to Consumer, Closing the Environmental Loop, Planning for Efficiency, Ensuring Quality. |
| 1624 | Manufacturing Systems - Recommended for Students Grades 9 - 12 - Course introduces students in a general fashion to the manner in which materials are processed and transformed using various methods. Processing techniques covered may include casting, forming, separating, assembling, and finishing. The courses may also include an overview of management techniques in planning, organizing, and controlling various segments of the manufacturing process, including design, engineering, production, and marketing. Students may organize a "company" and create products for sale. |

Maintenance, Installation and Repair: People with careers in Maintenance, Installation and Repair perform preventive maintenance procedures on machines tools and equipment These are performed routinely and on a regular basis. They also troubleshoot and repair electrical, electronic and mechanical systems. This will include mechanical repair as well as using computer-based inventory control systems, retrieving information histories on each machine from computer records, and recording repair activities on the system to keep accurate records of repairs performed on each machine.

| Program Learning Outcomes from the NASDCTE Common Career Technical Core for MAINTENANCE, INSTALLATION AND REPAIR CAREER PATHWAY: | |
|--|---|
| <i>Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.</i> | |
| 1. | Demonstrate maintenance skills and proficient operation of equipment to maximize manufacturing performance. |
| 2. | Demonstrate the safe use of manufacturing equipment to ensure a safe and healthy environment. |
| 3. | Diagnose equipment problems and effectively repair manufacturing equipment. |
| 4. | Investigate and employ techniques to maximize manufacturing equipment performance. |
| 5. | Implement a preventative maintenance schedule to maintain manufacturing equipment, tools and workstations. |
| 6. | Implement an effective, predictive and preventive manufacturing equipment maintenance program. |

| PROGRAM OF STUDIES COURSE SEQUENCE FOR MAINTENANCE, INSTALLATION AND REPAIR CAREER PATHWAY | | | | |
|---|---|--|--|---|
| | 9 th Grade | 10 th Grade | 11 th Grade | 12 th Grade |
| Career and Technical Courses and/or Degree Major Courses as Dual Credit | 1605 Diversified Occupations | 1654 Manufacturing For Tomorrow | 1624 Manufacturing Systems | <i>Has to be developed by a post secondary institution:</i> Applications in Manufacturing Technology |
| Suggestions for Enrichment to POS | 431 Air Conditioning 432 Refrigeration | 433 Heating 434 Air Conditioning/ Refrigeration | 462 Electricity/ Electronics-General 435 Air Conditioning/ Heating/Refrigeration 436 Heating/ Ventilation/Air Conditioning | 463 Particular Topics in Electricity/ Electronics 437 Particular Topics in HVACR |

| PROGRAM LEARNING OUTCOMES MATRIX FOR MAINTENANCE, INSTALLATION AND REPAIR CAREER PATHWAY: | | | | | | | |
|---|----------------------------|---------------------------|---|---|---|---|---|
| <i>Note: each dot represents the understanding that the student taking that course would have the best opportunity to know and be able to do the CCTC knowledge and skill standards listed above.</i> | | | | | | | |
| Courses in the POS | | Program Learning Outcomes | | | | | |
| STARS No. | Course Title | 1 | 2 | 3 | 4 | 5 | 6 |
| 1605 | Diversified Occupations | | | | | | |
| 1654 | Manufacturing For Tomorrow | | | | | | |
| 1624 | Manufacturing Systems | | | | | | |

| STARS No. | Course Descriptions: |
|-----------|--|
| 1605 | Diversified Occupations - Recommended for Students Grades 9 - 12 - Course helps students enter the work force through career exploration, job search and application, and by developing positive work attitudes and work related skills. Career planning and selection, money management, communication skills, interpersonal business relationships and behavior, and personal responsibility are typical topics covered in diversified occupations courses. Employment may be a required component of this course, or students may be required to enroll concurrently in a work experience course. |
| 1654 | Manufacturing For Tomorrow - Grades 9 -12 - Ford Partnership for Advance Studies course that addresses 4 manufacturing modules: From Concept to Consumer, Closing the Environmental Loop, Planning for Efficiency, Ensuring Quality. |
| 1624 | Manufacturing Systems - Recommended for Students Grades 9 - 12 - Course introduces students in a general fashion to the manner in which materials are processed and transformed using various methods. Processing techniques covered may include casting, forming, separating, assembling, and finishing. The courses may also include an overview of management techniques in planning, organizing, and controlling various segments of the manufacturing process, including design, engineering, production, and marketing. Students may organize a "company" and create products for sale. |

Manufacturing Production Process: People with careers in production work on the shop floor making parts or assembling them. They work with machines, making or assembling electronic parts, constructing or assembling modular housing, performing welding jobs, or printing various materials.

| Program Learning Outcomes from the NASDCTE Common Career Technical Core for MANUFACTURING PRODUCTION PROCESS CAREER PATHWAY: | |
|--|---|
| <i>Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.</i> | |
| 1. | Produce quality products that meet manufacturing standards and exceed customer satisfaction. |
| 2. | Research, design and implement alternative manufacturing processes to manage production of new and/or improved products. |
| 3. | Monitor, promote and maintain a safe and productive workplace using techniques and solutions that ensure safe production of products. |
| 4. | Implement continuous improvement processes in order to maintain quality within manufacturing production. |
| 5. | Develop procedures to create products that meet customer needs. |

| PROGRAM OF STUDIES COURSE SEQUENCE FOR MANUFACTURING PRODUCTION PROCESS CAREER PATHWAY | | | | |
|---|------------------------------|----------------------------|---------------------------------|---|
| | 9 th Grade | 10 th Grade | 11 th Grade | 12 th Grade |
| Career and Technical Courses and/or Degree Major Courses as Dual Credit | 1605 Diversified Occupations | 1624 Manufacturing Systems | 1654 Manufacturing For Tomorrow | <i>Has to be developed by a post secondary institution:</i> |
| Suggestions for Enrichment to POS | | | | <i>*Applications in Manufacturing Technology</i> |

| Program Learning Outcomes Matrix for Manufacturing Production Process Career Pathway: | | | | | | |
|---|----------------------------|---------------------------|---|---|---|---|
| <i>Note: each dot represents the understanding that the student taking that course would have the best opportunity to know and be able to do the CCTC knowledge and skill standards listed above.</i> | | | | | | |
| Courses in the POS | | Program Learning Outcomes | | | | |
| STARS No. | Course Title | 1 | 2 | 3 | 4 | 5 |
| 1605 | Diversified Occupations | | | | | |
| 1654 | Manufacturing For Tomorrow | | | | | |
| 1624 | Manufacturing Systems | | | | | |

| STARS No. | Course Descriptions: |
|-----------|--|
| 1605 | Diversified Occupations - Recommended for Students Grades 9 - 12 - Course helps students enter the work force through career exploration, job search and application, and by developing positive work attitudes and work related skills. Career planning and selection, money management, communication skills, interpersonal business relationships and behavior, and personal responsibility are typical topics covered in diversified occupations courses. Employment may be a required component of this course, or students may be required to enroll concurrently in a work experience course. |
| 1654 | Manufacturing For Tomorrow - Grades 9 -12 - Ford Partnership for Advance Studies course that addresses 4 manufacturing modules: From Concept to Consumer, Closing the Environmental Loop, Planning for Efficiency, Ensuring Quality. |
| 1624 | Manufacturing Systems - Recommended for Students Grades 9 - 12 - Course introduces students in a general fashion to the manner in which materials are processed and transformed using various methods. Processing techniques covered may include casting, forming, separating, assembling, and finishing. The courses may also include an overview of management techniques in planning, organizing, and controlling various segments of the manufacturing process, including design, engineering, production, and marketing. Students may organize a "company" and create products for sale. |

Production: People with careers in production work on the shop floor making parts or assembling them. They work with machines, making or assembling electronic parts, constructing or assembling modular housing, performing welding jobs, or printing various materials.

| Program Learning Outcomes from the NASDCTE Common Career Technical Core for PRODUCTION CAREER PATHWAY: | |
|--|--|
| <i>Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.</i> | |
| 1. | Diagnose production process problems and take corrective action to meet production quality standards. |
| 2. | Manage safe and healthy production working conditions and environmental risks. |
| 3. | Make continuous improvement recommendations based on results of production process audits and inspections. |
| 4. | Coordinate work teams when producing products to enhance production process and performance. |
| 5. | Demonstrate the safe use of manufacturing equipment. |

| PROGRAM OF STUDIES COURSE SEQUENCE FOR PRODUCTION CAREER PATHWAY: | | | | |
|--|----------------------------|---|--|--|
| | 9 th Grade | 10 th Grade | 11 th Grade | 12 th Grade |
| Career and Technical Courses and/or Degree Major Courses as Dual Credit | 1624 Manufacturing Systems | 304 Computer Applications | 1654 Manufacturing For Tomorrow | <i>Has to be developed by a post secondary institution in Applications in Manufacturing Technology</i> |
| Suggestions for Enrichment to POS | 2414 Welding 1 | 2416 Welding 2 713 Blueprint Reading-Related 2495 Precision Metalwork | 2417 Welding 3 2496 Precision Metalwork | 2497 Precision Metalwork |

| Program Learning Outcomes Matrix for PRODUCTION CAREER PATHWAY: | | | | | | |
|--|----------------------------|---------------------------|---|---|---|---|
| Courses in the POS | | Program Learning Outcomes | | | | |
| STARS No. | Course Title | 1 | 2 | 3 | 4 | 5 |
| 304 | Computer Applications | | | | | |
| 1654 | Manufacturing For Tomorrow | | | | | |
| 1624 | Manufacturing Systems | | | | | |

Programs of Study and Certifications Working Document

| STARS No. | Course Descriptions: |
|-----------|---|
| 304 | Computer Applications - Grades 10-12 – In Computer Applications II, the emphasis is on the mastery of advanced computer usage techniques for post high school education and career enhancement. Topics include: language scripting, advanced telecommunications with national and international access, the consolidation of word processing, database and spreadsheet skills into report production, advanced computer graphic manipulation, desktop integration for industry publication, beginning multi-platform network information management, and multimedia presentations. |
| 1654 | Manufacturing For Tomorrow - Grades 9 -12 - Ford Partnership for Advance Studies course that addresses 4 manufacturing modules: From Concept to Consumer, Closing the Environmental Loop, Planning for Efficiency, Ensuring Quality. |
| 1624 | Manufacturing Systems - Recommended for Students Grades 9 - 12 - Course introduces students in a general fashion to the manner in which materials are processed and transformed using various methods. Processing techniques covered may include casting, forming, separating, assembling, and finishing. The courses may also include an overview of management techniques in planning, organizing, and controlling various segments of the manufacturing process, including design, engineering, production, and marketing. Students may organize a "company" and create products for sale. |

Quality Assurance: Quality Assurance employees assure that standards and procedures are adhered to and that delivered products or services meet performance requirements. They may have responsibility for monitoring and maintaining the quality of parts and manufacturing processes. This could include identifying the raw product to ensure it meets specifications, as well as measuring or otherwise testing products and parts to ensure they meet required customer specifications.

| Program Learning Outcomes from the NASDCTE Common Career Technical Core: | |
|---|--|
| 1. | Evaluate production operations for product and process quality. |
| 2. | Recommend and implement continuous improvement in manufacturing processes. |
| 3. | Coordinate work teams to create a product that meets quality assurance standards. |
| 4. | Employ project management processes using data and tools to deliver quality, value-added products. |
| 5. | Perform safety inspections and training to ensure a safe and healthy workplace. |
| 6. | Implement continuous improvement processes to maintain quality products. |
| 7. | Identify inspection processes that ensure products meet quality specifications. |

| POS Course Sequence: | | | | |
|---|------------------------------|----------------------------|---------------------------------|--|
| | 9 th Grade | 10 th Grade | 11 th Grade | 12 th Grade |
| Career and Technical Courses and/or Degree Major Courses as Dual Credit | 1605 Diversified Occupations | 1624 Manufacturing Systems | 1654 Manufacturing For Tomorrow | <i>Has to be developed by a post secondary institution in Applications in Manufacturing Technology</i> |

| Program Learning Outcomes Matrix: | | | | | | | | |
|--|----------------------------|---------------------------|---|---|---|---|---|---|
| Courses in the POS | | Program Learning Outcomes | | | | | | |
| STARS No. | Course Title | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1605 | Diversified Occupations | | | | | | | |
| 1654 | Manufacturing For Tomorrow | | | | | | | |
| 1624 | Manufacturing Systems | | | | | | | |

| STARS No. | Course Descriptions: |
|-----------|--|
| 1605 | Diversified Occupations - Recommended for Students Grades 9 - 12 - Course helps students enter the work force through career exploration, job search and application, and by developing positive work attitudes and work related skills. Career planning and selection, money management, communication skills, interpersonal business relationships and behavior, and personal responsibility are typical topics covered in diversified occupations courses. Employment may be a required component of this course, or students may be required to enroll concurrently in a work experience course. |
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