JTED CURRICULUM WRITING

SCOPE & SEQUENCE

PRECISION MACHINING

The following scope & sequence was created collaboratively by teachers considering a variety of factors including:

- Recruitment and retention "draws" to attract students to the program
- Business and Industry Committee Recommendations
- End of Program Assessments
- A.D.E. and Industry Standards (Auto=NATEF, AYES)

YEAR ONE – 1st QUARTER

STANDARDS ADDRESSED

A. Career Planning: Each Pima County JTED student will analyze his or her interests, aptitude and skills to plan for a future career

C. Productivity and Accountability Each Pima County JTED student will demonstrate productivity and accountability.

STANDARD 1.0 – DESIGN A JOB PROCESS PLAN
STANDARD 2.0 – APPLY ENGINEERING DRAWING AND SKETCH TERMS, COMPONENTS, AND SYMBOLS
STANDARD 3.0 – PRODUCE A PRODUCT(S) USING A PROCESS PLAN
STANDARD 9.0 – MAINTAIN EQUIPMENT, TOOLS, AND WORKSTATIONS
STANDARD 10.0 – PERFORM SAFETY AND HEALTH REQUIREMENTS FOR MAINTENANCE, INSTALLATION AND REPAIR
STANDARD11.0 – DEMONSTRATE MATHEMATICAL CONCEPTS IN MANUFACTURING

First Unit: Introduction Career Planning	2 week
A.1 Complete a self-assessment of aptitudes and interests A.2 Examine employment trends in an industry or occupation related to self-assessment results (including nature of work, projections, educational requirements, wages, related occupations, etc.) A.3 Explain how personal choices, including online activities, affect career	

opportunities A.4 Participate in career development events A.5 Create a plan to transition from school to career
Second Unit: Safety, General, Hand Tools, and Machine Specific 2 weeks
9.1 Identify the benefit of maintaining a clean, safe, and functional work/duty station 10.1 Monitor equipment and operator performance to ensure workplace safety and compliance with local and national regulations 10.2 Maintain all relevant equipment operation and repair certifications 10.3 Identify and use personal protective equipment
Third Unit: Mathematics 2 weeks
11.1 Add, subtract, multiply, and divide whole numbers without a calculator 11.2 Calculate fractions and decimals and perform metric conversions with or without a calculator 11.3 Apply basic geometric concepts and terminology (e.g., planes, perpendicularity, Cartesian coordinates, concentricity, parallelism, straightness, flatness, circularity, and symmetry) 11.4 Solve for an unknown in a trade formula using standard formulas and arithmetic operations to make required calculations with or without a calculator 11.5 Solve for unknowns in right triangles with or without a calculator 11.6 Calculate means, medians, modes, and ranges with or without a calculator 11.7 Follow a set of instructions laid out in a sequence 11.8 Interpret and follow if-then instructions
Fourth Unit: Precision Measurement 1 week
7.10 Read various precision measuring instruments (i.e., caliper, micrometer)
Fifth Unit: Drawing and Blueprint Reading 1 week

2.1 Read and interpret blueprint drawings, symbols, scales, and legends
2.2 Relate information on blueprints to actual parts
2.3 Identify and use drawing dimensions
2.4 Sketch and dimension drawings

Sixth Unit: Productivity and Accountability
1 week

C.1 Demonstrate an understanding of employer/employee expectations
C.2 Practice effective time management through daily attendance, punctuality and by staying productive on the job
C.3 Explain the relationship of attitude to workplace success
C.4 Perform job duties with minimal supervision while being accountable for results
C.5 Demonstrate the ability to complete and maintain personal and professional documents
C.6 Develop a personal and/or professional growth plan and goals

YEAR ONE – 2nd QUARTER

STANDARDS ADDRESSED

STANDARD 1.0 – DESIGN A JOB PROCESS PLAN
STANDARD 3.0 – PRODUCE A PRODUCT(S) USING A PROCESS PLAN
STANDARD 9.0 – MAINTAIN EQUIPMENT, TOOLS, AND WORKSTATIONS
D. Communication Skills Each Pima County JTED student will communicate effectively in the workplace.

Seventh Unit: Process Planning
1 week

1.1 Develop a process plan for a part requiring milling, drilling, turning, or grinding
1.2 Fill out an operation sheet detailing the process plan, tool list, and required speeds and feeds

Eighth Unit: Produce a Product

7 weeks
3.1 Use a hand drill and hand tap holes in aluminum stock 3.2 Use files, scrapers, and coated abrasives to deburr parts 3.3 Use arbor/hydraulic presses to perform press fits 3.4 Use bench vises to hold parts for assembly 3.5 Layout the location of hole centers and surfaces within an accuracy of +/- .015 inches 3.6 Set up, chuck, and carry out between centers turning operations for straight turning 3.12 Set up and perform routine drill press operations 9.8 Identify tool and cutting lubricants and their application
Ninth Unit: Communications 1 week
D.1 Listen effectively for meaning in both verbal and non-verbal communication D.2 Identify barriers to effective communication D.3 Ask appropriate questions in seeking clarification D.4 Effectively communicate for a range of purposes (e.g. to inform, instruct, motivate and persuade) in diverse environments D.5 Choose and demonstrate appropriate methods of effective communication (written, technical, verbal, visual)

YEAR ONE – 3rd QUARTER

STANDARDS ADDRESSED

STANDARD 3.0 – PRODUCE A PRODUCT(S) USING A PROCESS PLAN
STANDARD 9.0 – MAINTAIN EQUIPMENT, TOOLS, AND WORKSTATIONS
I. Wellness Each Pima County JTED student will analyze components of personal wellness that impact job performance.

Tenth Unit: Produce a Product II 8 weeks
3.1 Use a hand drill and hand tap holes in aluminum stock 3.2 Use files, scrapers, and coated abrasives to deburr parts 3.3 Use arbor/hydraulic presses to perform press fits 3.4 Use bench vises to hold parts for assembly 3.5 Layout the location of hole centers and surfaces within an accuracy of +/- .015 inches 3.6 Set up, chuck, and carry out between centers turning operations for straight turning 3.12 Set up and perform routine drill press operations 9.8 Identify tool and cutting lubricants and their application

Eleventh Unit: Wellness
1 week

I.1 Analyze sources of stress and stress management techniques
I.2 Discuss and develop skills for dealing with crisis
I.3 Evaluate risk-taking behaviors
I.4 Identify and analyze components of a healthy lifestyle that lead to a productive work environment

YEAR ONE – 4th QUARTER

STANDARDS ADDRESSED

STANDARD 3.0 – PRODUCE A PRODUCT(S) USING A PROCESS PLAN
STANDARD 9.0 – MAINTAIN EQUIPMENT, TOOLS, AND WORKSTATIONS
STANDARD 4.0 – DESIGN A MANUFACTURING PROCESS FOR A NEW MACHINED PRODUCT
G. Problem Solving and Decision Making Each Pima County JTED student will demonstrate the ability to think critically, problem solve and make decisions.

Twelfth Unit: Produce a Product III
3 weeks

3.1 Use a hand drill and hand tap holes in aluminum stock
3.2 Use files, scrapers, and coated abrasives to deburr parts
3.3 Use arbor/hydraulic presses to perform press fits
3.4 Use bench vises to hold parts for assembly
3.5 Layout the location of hole centers and surfaces within an accuracy of +/- .015 inches
3.6 Set up, chuck, and carry out between centers turning operations for straight turning
3.12 Set up and perform routine drill press operations
9.8 Identify tool and cutting lubricants and their application

Thirteenth Unit: Shop and Machine Maintenance
3 weeks

9.1 Identify the benefit of maintaining a clean, safe, and functional work/duty station
9.2 Inspect and assess the general condition of an assigned machine tool
9.3 Monitor equipment indicators to ensure correction operation

9.4 Make routine adjustments as necessary and as authorized
9.5 Carry out daily, weekly, and/or monthly routine maintenance of machine tools as cited on checklists
9.6 Inspect and assess the condition of fixtures and cutting tools
9.7 Identify worn/damaged cutting tools and repair or regrind
9.9 Identify the protocol pertaining to inoperative/malfunctioning equipment

Fourteenth Unit: Design a Manufacturing Process
2 weeks

4.1 Identify potential machining processes for a new product
4.2 Establish criteria for determining optimal machining process
4.3 Identify equipment for a new machining process
4.4 Prepare production documentation for a machining process

Fifteenth Unit: Problem Solving and Decision Making
1 week

G.1 Select and evaluate resources and establish priorities needed to solve a problem
G.2 Identify and ask significant questions that clarify various points of view
G.3 Develop a plan of action with a timeline, chart or sequence of steps
G.4 Apply problem solving processes to solve different kinds of problems using critical, creative and/or innovative thinking
G.5 Interpret information, draw conclusions and formulate decisions based on analysis
G.6 Implement solutions and make adjustments when there is a need or opportunity for improvement

YEAR TWO- 1ST QUARTER

STANDARDS ADDRESSED

STANDARD 3.0 PRODUCE A PRODUCT(S) USING A PROCESS PLAN
STANDARD 9.0 MAINTAIN EQUIPMENT, TOOLS, AND WORKSTATIONS
STANDARD 10.0 PERFORM SAFETY AND HEALTH REQUIREMENTS FOR MAINTENANCE, INSTALLATION AND REPAIR

E. Leadership and Collaboration Each Pima County JTED student will demonstrate the ability to lead and contribute as a member of a team.

First Unit First Unit: Introduction and Leadership/CTSO
2 weeks

E.1 Describe characteristics of an effective team
E.2 Demonstrate the ability to work effectively and respectfully with diverse teams
E.3 Contribute to a team by sharing expertise, information and workload
E.4 Share responsibility for collaborative work and value contributions made by team members
E.5 Collaborate effectively with other teams/team members to meet a goal
E.6 Identify personal leadership styles and discuss how leadership styles affect interactions in an organization
E.7 Determine the roles and responsibilities of effective leaders and effective members of organizations
E.8 Facilitate and delegate responsibilities to best accomplish a goal
E.9 Give and receive constructive feedback
G.1 Select and evaluate resources and establish priorities needed to solve a problem
G.2 Identify and ask significant questions that clarify various points of view
G.3 Develop a plan of action with a timeline, chart or sequence of steps
G.4 Apply problem solving processes to solve different kinds of problems using critical, creative and/or innovative thinking
G.5 Interpret information, draw conclusions and formulate decisions based on analysis
G.6 Implement solutions and make adjustments when there is a need or opportunity for improvement

Second Unit: Safety, General, Hand Tools, and Machine Specific
2 weeks

9.1 Identify the benefit of maintaining a clean, safe, and functional work/duty station
10.1 Monitor equipment and operator performance to ensure workplace safety and compliance with local and national regulations
10.2 Maintain all relevant equipment operation and repair certifications
10.3 Identify and use personal protective equipment

Third Unit Produce a Product, NIMS Certification Projects
5 weeks

3.2 Use files, scrapers, and coated abrasives to deburr parts
3.6 Set up, chuck, and carry out between centers turning operations for straight turning
3.7 Set up and perform a milling operation to square up the six surfaces of a block to within +/- .002 and .002 over 4.5 inches squareness
3.8 Set up and operate vertical milling machines with the location of the hole centers within +/- .005 inches
3.9 Ring test grinding wheels, perform visual safety inspection, and mount and dress a grinding wheel in preparation for surface grinding
3.10 Set up, dress the grinding wheel, and operate manual surface grinders with an 8-inch or smaller diameter wheel
3.11 Perform routine surface grinding, the location of surfaces, and the squaring of surfaces
3.13 Use the principles of Cartesian coordinates to develop a program for the manufacture of a simple part
3.14 Develop a program for the CNC manufacture of a simple part
3.15 Identify the differences in the capability of multi-axis CNC equipment

YEAR TWO- 2ND QUARTER

STANDARDS ADDRESSED

STANDARD 3.0 – PRODUCE A PRODUCT(S) USING A PROCESS PLAN
H. Legal and Ethical Issues Each Pima County JTED student will practice legal and ethical behavior.

Fourth Unit: Produce a Product, NIMS Certification Projects II
8 weeks

3.2 Use files, scrapers, and coated abrasives to deburr parts
3.6 Set up, chuck, and carry out between centers turning operations for straight turning
3.7 Set up and perform a milling operation to square up the six surfaces of a block to within +/- .002 and .002 over 4.5 inches squareness
3.8 Set up and operate vertical milling machines with the location of the hole centers within +/- .005 inches
3.9 Ring test grinding wheels, perform visual safety inspection, and mount and dress a grinding wheel in preparation for surface grinding
3.10 Set up, dress the grinding wheel, and operate manual surface grinders with an 8-inch or smaller diameter wheel
3.11 Perform routine surface grinding, the location of surfaces, and the squaring of surfaces
3.13 Use the principles of Cartesian coordinates to develop a program for the manufacture of a simple part

3.14 Develop a program for the CNC manufacture of a simple part
3.15 Identify the differences in the capability of multi-axis CNC equipment

Fifth Unit: Legal and Ethical Issues
1 week

H.1 Define the attributes of honesty, integrity and professionalism
H.2 Practice ethical and professional behavior when interacting with others
H.3 Examine the relationship between ethics and the law
H.4 Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of electronic information

YEAR TWO- 3rd QUARTER

STANDARDS ADDRESSED

STANDARD 3.0 – PRODUCE A PRODUCT(S) USING A PROCESS PLAN

Sixth Unit: Produce a Product, NIMS Certification Projects III
9 weeks

3.2 Use files, scrapers, and coated abrasives to deburr parts
3.6 Set up, chuck, and carry out between centers turning operations for straight turning
3.7 Set up and perform a milling operation to square up the six surfaces of a block to within +/- .002 and .002 over 4.5 inches squareness
3.8 Set up and operate vertical milling machines with the location of the hole centers within +/- .005 inches
3.9 Ring test grinding wheels, perform visual safety inspection, and mount and dress a grinding wheel in preparation for surface grinding
3.10 Set up, dress the grinding wheel, and operate manual surface grinders with an 8-inch or smaller diameter wheel
3.11 Perform routine surface grinding, the location of surfaces, and the squaring of surfaces
3.13 Use the principles of Cartesian coordinates to develop a program for the manufacture of a simple part
3.14 Develop a program for the CNC manufacture of a simple part
3.15 Identify the differences in the capability of multi-axis CNC equipment

YEAR TWO- 4TH QUARTER

STANDARDS ADDRESSED
STANDARD 5.0 – IMPLEMENT PROCESS ADJUSTMENT AND IMPROVEMENT **STANDARD 6.0 – PRODUCE A PRODUCT TO SATISFY CUSTOMER NEEDS** **STANDARD 7.0 – CORRECT PROCESSES TO ENSURE THAT PRODUCTS MEET QUALITY STANDARDS** **STANDARD 8.0 – APPLY AN ENGINEERING PROBLEM-SOLVING AND DESIGN PROCESS** **B. Job Search Skills** Each Pima County JTED student will develop effective job search skills. **F. Technological Literacy** Each Pima County JTED student will incorporate the use of technology in the workplace.
Seventh Unit: Engineering Problem Solving 7 weeks
5.1 Analyze the performance of a single-part production process 5.2 Formulate process adjustments or improvements where appropriate 5.3 As a member of a process team, analyze the performance of a production process 5.4 With the team, formulate process adjustments or improvements where appropriate 5.5 Utilize Statistical Process Control (SPC) terminology (e.g., range, x-bar chart, order of operations, variation, mean, tolerance) 6.1 Verify that needed resources are available for the production process 6.2 Inspect the product to verify that it meets specifications 6.3 Document product and process to ensure formal compliance with customer requirements 7.1 Develop a process inspection plan 7.2 Develop a sampling plan for sample data 7.3 Verify the calibration of gauges and other data collection equipment 7.4 Inspect simple parts, applying appropriate precision measurement techniques, instruments, and gauges 7.5 Develop a process chart, and graph and interpret sample data 7.6 Make recommendations relative to production conditions indicated by the process charts 7.7 Identify closed-loop corrective action to provide ongoing production feedback 7.8 Record the process outcomes, identify the trends, and recognize the needs for improvement 7.9 Identify and report performance and training issues to assess their effect on quality 7.10 Read various precision measuring instruments (i.e., caliper, micrometer) 8.1 Apply a structured approach to solving problems (e.g., define a problem; brainstorm, research, and generate ideas; identify criteria and constraints; explore

possibilities; make a physical, mathematical, or conceptual model; test and analyze the solution; and communicate results) 8.2 Use troubleshooting to determine why something does not perform to standard 8.3 Examine the relationship between components of a complex product 8.4 Examine design criteria and constraints (e.g., cost, time, quality, manufacturability, testability, serviceability, human factors, environmental factors, and technology trends) as they relate to production
Eighth Unit: Job Search Skills 1 week
B.1 Explain the steps required in a job search B.2 Use technology and traditional methods to research employment opportunities B.3 Complete a traditional and online job application B.4 Exhibit effective ways to market oneself as a professional B.5 Prepare a professional email address, employment resume, portfolio and cover letter B.6 Demonstrate professionalism and confidence in an interview