

AUTOMATED MANUFACTURING TECHNOLOGY NYS



PURPOSE

To evaluate each contestant's preparation for employment in automated manufacturing and the team approach to problem-solving work environment. To recognize outstanding students for excellence and professionalism in the field of automated manufacturing technology.

ELIGIBILITY (Team of 3)

Open to a team of three active SkillsUSA members enrolled in programs with precision machining, automated manufacturing, or CAD/CAM or CNC as the occupational objective.

CLOTHING REQUIREMENT

White crew neck short-sleeved T-shirt, work pants, safety glasses with side shields or goggles, leather or steel-toed work shoes, hair must be contained. (Prescription glasses can be used only if they are equipped with side shields or safety glasses designed to go over glasses. If not, they must be covered with goggles.)

Note: Contestants must wear their official contest clothing to the contest orientation meeting. Also bring #2 pencil, resume, and safety assurance form.

EQUIPMENT AND MATERIALS

1. Supplied by the NYS chair/committee:
 - a. CNC machining center with:
 1. Machinist vise
 2. Hold-downs and clamps
 3. Tool holders
 4. End mills
 - b. Part(s) design
 - c. Competition packet
 - d. Pencils
 - e. Blank diskettes or USB thumb drives
 - d. Material for machining
2. Supplied by the contestants:

- a. All competitors must create a one-page résumé using a word processor. Resume to be handed in at the orientation meeting. Failure to do so will result in a 10 point penalty.

Note: Your contest may also require a hard copy of your résumé as part of the actual contest. Check the Contest Guidelines and/or the updates page on the NYS SkillsUSA Web site:

<http://www.nysskillsusa.org/>

- b. Two computers:
 1. One computer loaded with CAD software for CAD program
 2. One computer loaded with software for CAM program. This computer *must* have an open LAN Port (Ethernet connection and Windows XP SP#/Vista/7-32 or 64 bit. (must have administrator privilege to the computer to configure the address of the LAN port)
- c. Licensed versions of the above CAD and CAM software *must* be available at start of the orientation/practice session on Wednesday for loading onto the NYS chair/committee's computer(s).
- d. One 6" dial or digital vernier caliper
- e. One dial indicator. Dial indicator must have $\frac{3}{8}$ " holding shank to fit into tool holder supplied by the NYS chair/committee.
- f. One calculator
- g. One pair of $\frac{3}{4}$ " or 1" parallels
- h. One soft-face hammer
- i. One 6" or 12" steel rule
- j. Safety glasses with clear lenses.
- k. Each team must provide a USB memory device.
 1. Each team must provide a machinist handbook.
- m. Each team can provide appropriate sized end mills.

Note: Only the above listed items will be allowed in the contest area during the competition.

SCOPE OF THE CONTEST

The contest will test the ability to perform, exhibit and compile skills and knowledge from the following list of competencies determined by the NYS SkillsUSA Automated Manufacturing Technology contest committee.

Knowledge Performance

The contest includes a written knowledge test assessing general knowledge related to automated manufacturing technology. Written portions may also exist during the skills portion of the contest. The exam is an evaluation that measures ability to solve various solutions to the process that is involved in quoting a job in a rapid prototyping environment.

Skill Performance

The contest includes a team skill performance for three students and evaluates teams for employment in integrated manufacturing technology fields of computer-aided drafting/design (CAD), computer-aided manufacturing (CAM) and computer numerical controlled machining (CNC).

Contest Guidelines

1. All equipment provided by the NYS chair/committee will be in place and set before the competition begins. On the Wednesday before the competition, there will be an orientation/practice for all teams. Teams must bring their computers and above-listed equipment to the orientation on Wednesday. Teams will not be allowed to remove their computers from the competition area until after they have finished competing on Thursday. Tampering with or removing *any* of the equipment provided, during the practice period or the days of the competition, is grounds for disqualification.
2. During the orientation, teams will be divided into two groups.
3. Teams must be comprised of three members.
4. The teams will be presented with dimensioned drawing(s) of a part(s) to

- prototype during the contest.
5. The CAD operators construct the part geometry; the CAM operator generates the tool paths; and the CNC operator sets up and machines the part. When a team member has spare time, he or she will help others in the group.
6. One person should not dominate a team by doing the CAD drawing, the CAM toolpath, and running the CNC machine while using the other members simply as support. The contest is designed to promote creativity in organization of production responsibility.
7. All group members are responsible for double-checking each other's work and quality control.
8. When the teams finish machining the prototype part(s), they will present it to the client (judges). At this time, they will be presented with a second drawing(s) as either a change order or as an additional part(s).
9. Each team will be issued a notebook. This will be a three-ring view binder. Included in the binder will be all the necessary information and forms to complete the project. These forms will not be highly specific but will coach the teams.
10. All packets, forms and drawings must be turned in to the judges at the end of the competition.

Standards and Competencies

MFG 1.0 — Perform mathematical and measurement calculations used in automated manufacturing situations

- 1.1 Measure work pieces to the nearest .001 inch
- 1.2 Calculate CNC speed and feeds
- 1.3 Calculate stock utilization and setup
- 1.4 Calculate tolerances
- 1.5 Calculate various variable to estimate costs and material usage written evaluation.

MFG 2.0 — Design, sketch and plan machine work to U.S. National CAD Standards

- 2.1 Transfer information from provided drawing to CAD drawing
- 2.2 Create CAD file for manufacturing using standard CAD terminology and standard practice
- 2.3 Initiate manufacturing documentation

- process
- 2.4 Generate a process plan
- 2.5 Plot a CAD file
- 2.6 Export a CAD file
- 2.7 Process Engineering Change Orders (ECO)
- 2.8 Repeat steps as necessary to accommodate ECO

MFG 3.0 — Create a toolpath (CAM file) and the CNC code

- 3.1 Create process plan (job plan)
- 3.2 Read-in CAD export file
- 3.3 Create toolpath
- 3.4 Verify toolpath
- 3.5 Create CNC code
- 3.6 Send CNC code to machine tool
- 3.7 Process Engineering Change Orders (ECO)
- 3.8 Repeat steps as necessary to accommodate ECO

MFG 4.0 — Perform CNC machining functions given a scenario

- 4.1 Verify CNC file existence
- 4.2 Verify toolpath
- 4.3 Set up fixture(s) and tooling on machine
- 4.4 Set up part(s) on mill
- 4.5 Set all offsets and tooling
- 4.6 Adjust machine speeds and feeds as needed
- 4.7 Complete an in-process quality assurance process
- 4.8 Perform tool changes

- 4.9 Perform multiple machining operations in one setup
- 4.10 Demonstrate proficiency in using a CNC machine tool and produce part(s)
- 4.11 Use Total Quality Management practices to verify process and part
- 4.12 Process Engineering Change Orders (ECO)
- 4.13 Repeat steps as necessary to accommodate ECO

MFG 5.0 — Perform and inspect part(s) using a Total Quality Management Process.

- 5.1 Verify part(s) to provided standards
- 5.2 Verify part(s) to ECO standards
- 5.3 Document process of verification and inspection

MFG 6.0 — Demonstrate safety practices in a working situation

- 6.1 Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines
- 6.2 Document safety activities as required
- 6.3 Demonstrate safety procedures in running and programming a CNC machine tool

MFG 7.0 — Provide an accurate quotation given an automated manufacturing technology simulated scenario

- 7.1 Solve various solutions to the process that are involved in quoting a job in a rapid prototyping environment.