

# MOBILE ROBOTICS TECHNOLOGY NYS



## PURPOSE

To evaluate each contestant's preparation for employment in the field of robotics with emphasis on the team approach to problem-solving in a work environment. To recognize outstanding performance for their excellence and professionalism in the emerging field of mobile robotics.

## ELIGIBILITY (Team of 2)

Open to a team of two active SkillsUSA members enrolled in a career and technical education engineering program or a program that integrates robotics, engineering or pre-engineering techniques as an integral component of the instructional program.

## CLOTHING REQUIREMENT

A white collared shirt (polo preferred), no tie, black pants, black shoes and black socks for the event. Safety Glasses will also be required.

(Prescription glasses can be used only if they are equipped with side shields. 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

This contest has to have a "Special Instructions to Contestants" form on the website by Feb. 1st.

1. Supplied by NY chair/committee
  - a. All necessary information for judges and contest committee.
  - b. A 10' x 10' space for working and displaying the robot.
  - c. One standard 120-volt electrical outlet
  - d. One standard 8' conference table
  - e. Description of robotic challenge
  - f. All the necessary tools and equipment for the contest

g. Vex Robotic Starter Kit or Festo Robotino

2. Supplied by contestants:
  - a. Computer with programming software, Wi-Fi capable with C++ or JAVA programming software installed and licensed.
  - b. Programming cable or other connection devices
  - c. Engineering Notebook
  - d. All competitors must create a one-page resume 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/>

Contestants will be asked to supply the computers with the below listed specifications as a minimum.

### Computer Specifications:

Each team is to provide one computer with the following:

- Pentium 4, 1 GHZ processor or higher with CD-ROM drive
- 1 GB RAM (or more)
- 100 MB available on the hard disk
- Operating system: Windows XP
- Super VGA or better graphics display, minimum 256 colors
- Mouse
- USB port

### SCOPE OF THE CONTEST

Teams are given a task they are asked to solve using a mobile robotic system provided by the technical committee. Teams will program a virtual robot and construct the mobile robot from reference documentation in engineering notebooks created by the teams prior to the contest. The contest will test the ability to document, construct, program and exhibit their solution to industry-based judges.

## **Knowledge Performance**

The contest will include a written exam assessing general knowledge of robotics operations and programming. Written portions may also exist during the skills portion of the contest.

## **Skill Performance**

The contest will include activities that simulate situations encountered by robotic programmers and support professionals.

## **Contest Guidelines**

1. Teams must be comprised of two members.
2. Teams are given a task that they will solve using a mobile robotic system provided by the technical committee.
3. Each team will have 10 minutes to present its engineering notebook to the judges.
4. Teams can only use an engineering notebook during the contest as a reference tool in the construction and programming of their robot.
5. The engineering notebook is a tool for students to document their designs prior to the competition. It can include pictures, printed out sections of code, detailed assembly instructions, etc. All pages must be bound and numbered.
6. Robot(s) can only be constructed by the materials supplied by the technical committee.
7. Teams will have two scored chances to solve the mobile robotic challenge.
8. Once a team has performed the required task or set of tasks, a design change may be introduced.
9. Contestants are required to adhere to industry safety standards using the hardware and software provided.
10. All team members are responsible for double-checking each other's work and quality control.
11. All engineering notebooks, forms, documentation and programs must be turned in to the judges at the end of the competition.
12. All team members and advisors are required to attend a debriefing session after the competition has concluded.

## **Standards and Competencies**

### **MR 1.0 — Demonstrate knowledge in safety rules and practice**

- 1.1 Maintain a safe work area
- 1.2 Demonstrate correct use of hand tools
- 1.3 Follow safety rules during robotic assembly.
- 1.4 Demonstrate proper use of safety equipment
- 1.5 Define and document all safety issues

### **MR 2.0 — Produce technical documentation**

- 2.1 Maintain professional engineering notebook
- 2.2 Document assembly instructions and illustrations
- 2.3 Produce Bill of Materials (BOM)
- 2.4 Document the engineering design process

### **MR 3.0 — Apply knowledge of robotic assembly and part identification**

- 3.1 Identify various parts used on a mobile robot (wheels, motors, gears, etc.)
- 3.2 Identify the various systems in a mobile robot
- 3.3 Demonstrate the use of various components of a mobile robot
- 3.4 Demonstrate proper assembly techniques

### **MR 4.0 — Understand mechanical systems of a robot**

- 4.1 Understand and identify the various types of gears and their application
- 4.2 Demonstrate the use of gears on a mobile robot
- 4.3 Understand and identify the various types of chain and sprocket mechanisms
- 4.4 Demonstrate proper mechanical component alignment

### **MR 5.0 — Wire a mobile robot**

- 5.1 Demonstrate proper wiring techniques
- 5.2 Maintain and analyze battery voltage
- 5.3 Understand and use multiple types of mobile robotic sensors
- 5.4 Understand and differentiate different types of motors and motor controllers

**MR 6.0 — Produce examples of basic computer programming and flowcharting**

- 6.1 Draw a programming flow chart representing a robot program for a given scenario
- 6.2 Develop a basic computer program to control robot
- 6.3 Manipulate feedback from robotic sensors in a program
- 6.4 Demonstrate proper commenting of code in a mobile robot program

**MR 7.0 — Presenting technical information and technical problem solving**

- 7.1 Demonstrate the knowledge of various visual aids used to present technical information
- 7.2 Present technical material in a professional manner
- 7.3 Demonstrate proper presentation techniques
- 7.4 Define team roles and responsibilities
- 7.5 Demonstrate ability to solve problems as a team in a given time frame
- 7.6 Demonstrate and document a comprehensive plan to solve an engineering problem
- 7.7 Use proper time management when solving a problem
- 7.8 Demonstrate efficient project management and planning

**MR 8.0 — Identify communication protocols for mobile robots**

- 8.1 Understand basic communication techniques in mobile robotics
- 8.2 Demonstrate proper communication between a transmitter and a robot