ENGINEERING TECHNOLOGY/DESIGN

PURPOSE

To recognize an outstanding engineering design project that has been developed by a three-member team of engineering or technology students. The student team will present its innovative idea along with a design board, a design prototype, and an engineering notebook.

ELIGIBILITY (TEAM OF THREE)

Open to active NYS SkillsUSA members enrolled in a career and technical education engineering program or a curriculum that integrates engineering/pre-engineering concepts and techniques as an integral component of the instructional strategies.

CLOTHING REQUIREMENTS

NYS SkillsUSA Official Attire:

- Official red blazer, NYS Black Jacket, the older red national windbreaker or older red sweater and the Black or red Jacket from Nationals.
  Button up, collared, white dress shirt (accompanied by a plain, solid black tie), white blouse (collarless or small-collared) or white turtleneck, with any collar not to extend into the lapel of the outer layer coats
- Black dress slacks accompanied by black dress socks or black or skin tone seamless hose) or black dress skirt (knee- length, accompanied by black or skin- tone seamless hose).
- Black shoes, that are not backless or open toe.

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

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
   a. A space for the design prototype and design board that is no bigger than 10'x10'
   b. One standard 120-volt electrical outlet
   c. One table
2. Supplied by the competitors team:
   a. Design prototype: The design prototype cannot be hazardous in any way. If the prototype is not conducive to being presented in an indoor facility, please notify the NYS SkillsUSA headquarters in advance so other arrangements can be made. Design prototypes must be transported and set up in the competition area Wed. 3–7 p.m. Set up engineering prototypes at contest locations. No help will be provided by NYS SkillsUSA.
   b. Design board
   c. Engineering notebook
   d. Industrial review of engineering design
   e. One laptop computer or tablet (needed for Q&A test component)
   f. One 6' multiple-outlet surge protector
   g. All competitors must create a one-page resume. See "Resume Requirement" below for guidelines.

RESUME REQUIREMENT

Competitors must create a one-page resume to submit at orientation.

DEVICES

Cell phones or other electronic devices not approved by the NYS Chairperson will be collected by the contest chair during the competition. Chairpersons will announce their acceptance by listing it on their standard or at the orientation meeting. In case of emergencies, advisors should allow the competitors to take their phones to the contest areas.

If the competitor uses their device in a manner which compromises the integrity of the competition, the competitor's score may be penalized.

OBSERVER RULE

No observers are permitted to enter the competition area during judging. Teams are invited to repeat their presentation to the public when they are done judging. Observers must avoid teams that are actively being judged, and observers will be asked to leave if they are disruptive during the judging process.

SCOPE OF THE COMPETITION

All competitors are required to take the SkillsUSA professional development test at orientation.

The team consists of three students; all enrolled in the same educational institution during the current school year. Students may be members of only one team per competition year and may not compete in more than one competition at a state level.

The project must be designed and constructed by students who are enrolled (or were enrolled immediately preceding the NYS Leadership and Skills Conference) in an engineering program or career and technical education program. Projects shall not continue or be "reused" from year to year.

Each team will have one design storyboard explaining the new innovation that was collaboratively developed. This must represent the engineering process, detailing brainstorming efforts, schedule, prototypes, modeling, relevant industry regulations, restrictions and laws, safety considerations and manufacturability as is relevant to design. The design board may not be any larger than a 36"x56" tri-fold display. Digital media, such as digital picture frames, can be attached to the design board. The board must be a comprehensive representation of the team's design process.

The design prototype must be an accurate reflection of what is being claimed in the oral explanation and presentation.

Importance is placed on the oral presentation, which is a maximum of 10 minutes. Following the presentation, there may be a question-and-answer session by the judging panel — not to exceed ten minutes — to clarify any questions that arise during the presentation.

The Q&A will have an additional test component where laptop or tablet will be mandatory.

Each team is required to have an industrial review of its proposed engineering design. This review must be conducted by engineers, technicians, or other technical professions within the design's respective industry.

Mentorship from the team's career and technical instructor, academic teachers, and representatives from the business and industry world, including engineers and industrial designers, is highly encouraged.

The panel of judges will consist of engineers, engineering educators and members from business and industry.

JUDGING CRITERIA

Each engineering presentation will be judged according to its own merits and compliance with the listed criteria. Participants should read the guidelines carefully to ensure the project presentation covers all the criteria.

1. **Design Prototype**

   The design prototype is a working model that demonstrates the results of the team's research and how the team has put its research into action. The design prototype must accurately reflect the engineering design accomplishment referred to in the presentation. These criteria include virtual modeling, schematics, assembly drawings. materials selection, ergonomics, manufacturing analysis, construction, and aesthetics. Students should be able to answer questions about their prototype and its development process. Design prototypes will be judged independently of the oral explanation and presentation.

2. **Engineering Notebook**

   Teams are required to keep an engineering notebook in either handwritten or digital format. This notebook shall chronologically document the engineering process used to design and prototype their innovation. The Engineering notebook shall have the following characteristics:

   a. Entries for handwritten notebooks must be written in permanent ink — not pencil.
   b. Corrections to entries must be initialed and any pictures or sketches must be properly mounted and initialed to "marry" the item into the notebook.
   c. The notebook must have a table of contents.
   d. Every page must be numbered.
   e. The notebook must include a balance of entries made by each team member.
   f. Every entry must be dated and signed.
   g. The entire engineering process should be documented - including but not limited to sketches, notes, calculations, evidence of research, photographs, test results, code descriptions, etc. as they apply to the design.
   h. A digital notebook using a portfolio or E-book software application is acceptable. All paper notebook guidelines apply. A backup copy of all information in PDF format shall be submitted on a non-returnable flash drive with the team number affixed.
   i. The notebook will be submitted to the judging team after that team's design prototype review. The notebook must be from the current school year in which the project is being presented

NOTE:

AI would not be appropriate for the ET design contest in final products. Please adhere to the National Guideline For Ethical Use Of AI. Note that any representation of AI in poster boards with material that would be generative technical content would not be allowed. If Ai tools are used for brainstorming and springboarding ideas, it must be documented that AI came up with the idea.

Excerpt from the National Guidelines for the Ethical Use Of AI

Integrity is a core value at SkillsUSA, and all student members must uphold this principle--whether using AI-based tools or otherwise. For competitions, responsible use of AI-based tools in completing tasks or assessments must be done in accordance with the following:

1. You must clearly identify the use of AI-based tools in your work. Any work that utilizes AI- based tools must be clearly marked and cited as such, including the specific tool(s) used.

2. You must be transparent in how you used the AI-based tool, including what work is your original contribution. An AI detector may be used to detect AI-driven work.

3. You must ensure your use of AI-based tools does not violate any copyright or intellectual property laws.

4. You must not use AI-based tools to cheat on assessments.

5. You must not use AI-based tools to plagiarize without citation.

Learning to use AI is an emerging skill, and competitors should be aware of the limits of AI tools. You may use AI programs, e.g. ChatGPT, to help generate ideas and brainstorm. However, you should note that the material generated by these programs may be inaccurate, incomplete, or otherwise problematic. You will be responsible for any errors or omissions provided by the tool. Beware that use may also stifle your independent thinking and creativity. **You may not submit any work generated by an AI program as your own.** If you include material generated by an AI program, it should be cited like any other reference material.

It works best for topics you understand. AI is a tool, but one that you need to acknowledge using. Please include a paragraph at the end of any assignment that uses AI explaining what you used the AI for and what prompts you used to get the results. Failure to do so violates the integrity policy. Be thoughtful about when this tool is useful. They don't always make products easier or better. Don't use it if it isn't appropriate for the case or circumstance.

3. **Oral Explanation and Presentation**
   Students must demonstrate appropriate mastery of the engineering project. Each student should take an equal role during the allotted presentation time. The presentation given by the entire group must reflect excellent presentation skills and clear communication and explanation of the technical process related to the engineering design project. This presentation must include analysis of the design feasibility.

4. **Industrial Review**
   The project must demonstrate evidence of the integration and involvement of business and industry related to the engineering field. Each team must present its design project to a technical person in that area of study. The reviewer is to provide written feedback to the team, which will be submitted to the judges at the NYS LSC. The industrial review must include feedback on the engineering design including feasibility, industry regulations, laws and/or standards, design safety, prototype quality and suggested improvements as they apply to the design.

5. **Design Process Storyboard**
   The storyboard will chronicle the comprehensive history of the innovation, from idea to reality. The storyboard will be judged on the explanation of the team's engineering process, to include brainstorming, scheduling (Gantt chart), cost of materials, consideration of industry regulations, laws, and limitations, safety, quality, product testing, redesign, overall appearance. The storyboard size shall not exceed a 36"x56" tri-fold board.

6. **Onsite Problem-Solving Activity**
   Teams will be given an onsite problem-solving activity during the competition to allow for judging of team synergy. Each team should bring one laptop computer or tablet for this activity. All other required materials will be provided by the technical committee.

7. **Overall Effect**
   The synergy of the overall presentation of the team's engineering design project and supplied materials must be projected in a businesslike and professional manner. The design prototype and presentation materials must be well organized. The judges will look for the students' display of knowledge, clear communication, and overall professionalism.

STANDARDS AND COMPETENCIES

ENG 1.0 — Integrate knowledge of basic engineering principles into technical writing and presentations following the guidelines the competition technical committee has established

1.1. [OBJ] Apply engineering knowledge in the areas of force, work, rate, resistance, energy, power, force transformers, momentum, waves and vibrations, energy converters, transducers, radiation, optical systems

ENG 2.0 — Transform existing systems into conceptual models

2.1. Transform conceptual models into determinable models
2.2. Use determinable models to obtain system specifications
2.3. Select optimum specifications and create physical models
2.4. Apply the results from physical models to create real target systems
2.5. Critically review real target systems and personal performance
2.6. Design effective and usable IT-based solutions and integrate them into the user environment
2.7. Assist in the creation of an effective project plan
2.8. Identify and evaluate current and emerging technologies and assess their applicability to address the users' needs

ENG 3.0 — Showcase knowledge of project planning

3.1. Apply brainstorming techniques
3.2. Implement benchmarking
3.3. Discuss continuous improvement
3.4. Explain cause and effect relationships
3.5. Apply knowledge of customer satisfaction
3.6. Demonstrate how to collect data
3.7. Apply decision-making skills
3.8. Define and describe a process
3.9. Empower team members
3.10. Recognize methods of idea generation
3.11. Prioritize tasks
3.12. Reach consensus amongst the team
3.13. Display teamwork during the competition
    3.13.1. Have equal team participation
    3.13.2. Show positive group dynamics
    3.13.3. Define team roles

ENG 4.0 — Developing/identifying opportunities

4.1. Identify and define the opportunity
    4.1.1. Identify the customer
    4.1.2. Identify the customer's needs
    4.1.3. State the problem or areas of improvement within the identified opportunity clearly and concisely
    4.1.4. Quantify the opportunity with data
4.2. Show data gathered from research
    4.2.1. Identify opportunity for improvement

4.3.   Make decisions based on facts, not opinions
4.4.   Show how the team determined the cause(s) of the problem and gained an understanding of the variation that occurs in the process
    4.4.1.   Diagram and perform a thorough assessment of the possible causes
4.5.   Develop various solutions
    4.5.1.   Show alternative approaches or changes that would improve the situation
    4.5.2.   Show the analysis used to select the most beneficial solution to implement
    4.5.3.   Define milestones
4.6.   Recommend a plan to implement the solution(s)
4.7.   Use analytical decision making by making full use of flow charts, bar graphs, cause and effect diagrams, Pareto diagrams, etc.
4.8.   Describe a method to standardize or institutionalize the process

ENG 5.0 — Write a problem statement
5.1.   Define the problem
5.2.   Define the customer
5.3.   Explain the customer expectations
5.4.   Describe the product or service
5.5.   Discuss how the product or service fulfills the customer's expectations
5.6.   List the needed data
5.7.   Reflect on how the process can be improved
5.8.   Describe how the improved process will meet or exceed the customer's expectations

ENG 6.0 — Design and deliver a presentation that discusses the problems and processes of the local institution
6.1.   Make the presentation clear and concise
6.2.   Use graphics effectively to clarify presentation topics
6.3.   Use time wisely while presenting

ENG7.0—Design and develop a presentation that is the result of findings from the on-site problem and process
7.1.   Make the presentation clear and concise
7.2.   Use graphics effectively to clarify presentation topics
7.3.   Use time wisely while presenting

ENG 8.0 — Deliver the presentation in a professional manner, meeting the standards outlined by the technical committee
8.1.   Explain the topic through the use of displays or practical operations
8.2.   Demonstrate an effective and pleasing delivery style
8.3.   Use verbal illustrations and examples effectively
8.4.   Make a formal and effective introduction to the presentation that clearly identifies the scope of the presentation
8.5.   Pronounce words in a clear and understandable manner
8.6.   Use a variety of verbal techniques including modulation of voice, changing volume, varied inflection, modifying tempo and verbal enthusiasm
8.7.   Demonstrate poise and self-control while presenting
8.8.   Demonstrate good platform development and personal confidence

8.9.   Communicate the primary points of the speech in a compact and complete manner
8.10.   Tie organizational elements together with an effective ending
8.11.   Complete the speech within the time limits set by competition requirements
8.12.   Develop storyboards for the presentation outlining the process

ENG 9.0 — SkillsUSA Framework

The SkillsUSA Framework is used to pinpoint the Essential Elements found in Personal Skills, Workplace Skills, and Technical Skills Grounded in Academics. Students will be expected to display or explain how they used some of these Essential Elements. Please reference the graphic in the previous column, as you may be scored on specific elements applied to your project. For more, visit: www.skillsusa.org/about/skillsusa-framework/.