Science, Technology, Engineering & Mathematics Career Cluster

1. Apply engineering skills in a project that requires project management, process control and quality assurance.

ST 1.1: Apply the skills and abilities in requirements analysis and configuration control while working plans, processes, and projects as assigned.
Sample Indicators:

- *No Sample Indicators.*

ST 1.2: Use the skills required in project management to track and assess the progress of a plan, process, or project as assigned.
Sample Indicators:

- *No Sample Indicators.*

ST 1.3: Apply the skills in quality assurance as well as those in process management and development for appropriate applications of systems integration techniques to an assigned project.
Sample Indicators:

- *No Sample Indicators.*

2. Use technology to acquire, manipulate, analyze and report data.

ST 2.1: Use IT tools to manipulate data and create reports, plans, processes or projects from data provided.
Sample Indicators:

- *Use statistical tools to analyze data.*
- *Query and extract information from data.*
- *Create knowledge from data.*

ST 2.2: Use modeling, simulation, or visual reproduction to effectively analyze, create, and/or communicate to others regarding plans, projects, problems, issues, or processes.
Sample Indicators:

- *Apply techniques for modeling systems or problems.*
- *Apply techniques for scientific visualization and animation of complex physical systems or problems.*
- *Test different scenarios to multiple variables.*

ST 2.3: Apply a currently applicable computer programming language to a process, project, plan or issue as assigned.
Sample Indicators:

- *Write a computer program, e.g., Java, C++.*

- *Execute a computer program, e.g., Java, C++.*

ST 2.4: Apply statistical tools that verify the reliability or validity of the data used or collected in the plan, project, process, or problem.
Sample Indicators:

- *Using a selected statistical tool, compute data reliability.*
- *Select and use the tools to analyze and synthesize data.*
- *Describe the meaning of probability and how it applies to a set of data.*

ST 2.5: Apply a technological, scientific, or mathematical concept (use of algorithms) when communicating with others on issues, plans, processes, problems, or concepts.
Sample Indicators:

- *Select the proper visualization tools.*
- *Use simulation, modeling, and prototype techniques to solve problems.*
- *Communicate data visually.*

3. Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.

ST 3.1: Apply appropriate safety and health practices when developing plans, projects, processes or solving complex problems.
Sample Indicators:

- *Exercise good safety practices.*
- *Follow various regulatory codes, such as EPA, FEMA, UL, OSHA, CSA.*
- *Reference and use material safety data sheets (MSDS).*
- *Encourage others to employ safe practices.*

ST 3.2: Use appropriate safety techniques, equipment, and processes in planning and /or project applications.
Sample Indicators:

- *Demonstrate safe use of tools and equipment.*
- *Develop and implement emergency plans.*
- *Develop and implement workplace lab safety plan.*
- *Follow workplace regulations and record-keeping requirements.*
- *Demonstrate the use of safety equipment in the workplace.*
- *Demonstrate the use of eyewash and safety showers*
- *Accurately interpret safety signs, symbols, and labels.*
- *Demonstrate basic first aid techniques.*

ST 3.3: Identify potential and existing hazards to plans, projects, or processes where safety, health, and environmental issues may be affected.
Sample Indicators:

- *Discuss physical, chemical, toxicological, biological, and radioactive hazards.*
- *Analyze environmental impacts.*
- *Conduct a safety audit.*

4. Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

ST 4.1: Describe the relationship between the STEM Career Cluster and society.
Sample Indicators:

- *No Sample Indicators.*

ST 4.2: Describe the effect society and the economy have upon the STEM Career Pathways.
Sample Indicators:

- *No Sample Indicators.*

ST 4.3: Understand STEM knowledge and skills to analyze and suggest solutions to human societal problems.
Sample Indicators:

- *No Sample Indicators.*

5. Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.

ST 5.1: Research and match career opportunities based upon their fit with personal career goals.
Sample Indicators:

- *Locate and interpret career information for at least one career pathway within the Career Cluster.*
- *Identify job requirements for the Career Cluster/pathway.*
- *Identify educational and credentialing requirements for careers within the Career Cluster.*

ST 5.2: Match personal interests and aptitudes to careers when researching opportunities within the pathways.
Sample Indicators:

- *Identify personal interests and aptitudes.*
- *Identify job requirements and characteristics for selected careers.*
- *Compare personal interests and aptitudes with job requirements and characteristics of the career selected.*
- *Modify career goals based on results of personal interests and aptitudes with career requirements and characteristics.*

ST 5.3: Develop a career plan for advancement in STEM careers.
Sample Indicators:

- *No Sample Indicators.*

ST 5.4: Engage in STEM experiences where an individual can identify personal interests and expectations for career and personal development.
Sample Indicators:

- *List resources for researching funding sources for scientific projects and technology.*
- *List careers that you have investigated, internships that you could apply for, and job shadowing opportunities that you have identified.*
- *Construct and maintain a portfolio of experiences and accomplishments.*

6. Demonstrate technical skills needed in a chosen STEM field.

Engineering & Technology Career Pathway (ST-ET)

1. Use STEM concepts and processes to solve problems involving design and/or production.

ST-ET 1.1: Apply the core concepts of technology and recognize the relationships with STEM systems (e.g., systems, resources, criteria and constraints, optimization and trade-off, and controls).
Sample Indicators:

- *No Sample Indicators.*

ST-ET 1.2: Develop the active use of information technology applications.
Sample Indicators:

- *No Sample Indicators.*

ST-ET 1.3: Use computer applications to solve problems by creating and using algorithms, and through simulation and modeling techniques.
Sample Indicators:

- *No Sample Indicators.*

2. Display and communicate STEM information.

ST-ET 2.1: Select and use information technology tools to collect, analyze, synthesize and display data to solve problems.
Sample Indicators:

- *No Sample Indicators.*

ST-ET 2.2: Read and create basic computer-aided engineering drawings.
Sample Indicators:

- *No Sample Indicators.*

3. Apply processes and concepts for the use of technological tools in STEM.

ST-ET 3.1: Use knowledge, techniques, skills and modern tools necessary for engineering practice.
Sample Indicators:

- *No Sample Indicators.*

ST-ET 3.2: Describe the elements of good engineering practice (e.g., understanding customer needs, planning requirements analysis, using appropriate engineering tools, prototyping, testing, evaluating and verifying).
Sample Indicators:

- *No Sample Indicators.*

ST-ET 3.3: Effectively use project management techniques (e.g., teamwork, appropriate time management practices, effective organizational skills, conduct analysis of cost, resources, and production capacity and quality practices with continuous improvement).
Sample Indicators:

- *No Sample Indicators.*

ST-ET 3.4: Illustrate the ability to characterize a plan and identify the necessary engineering tools that will produce a technical solution when given a problem statement.
Sample Indicators:

- *No Sample Indicators.*

4. Apply the knowledge learned in the study of STEM to provide solutions to human and societal problems in an ethical and legal manner.

ST-ET 4.1: Explain why and how the contributions of great innovators are important to society.
Sample Indicators:

- *No Sample Indicators.*

ST-ET 4.2: Explain the elements and steps of the design process and tools or techniques that can be used for each step.
Sample Indicators:

- *No Sample Indicators.*

ST-ET 4.3: Describe design constraints, criteria, and trade-offs in regard to variety of conditions (e.g., technology, cost, safety, society, environment, time, human resources, manufacturability).
Sample Indicators:

- *No Sample Indicators.*

5. Apply the elements of the design process.

ST-ET 5.1: Apply the design process using appropriate modeling and prototyping, testing, verification and implementation techniques.
Sample Indicators:

- *Exhibit an understanding of customer needs in the design process.*

ST-ET 5.2: Demonstrate the ability to evaluate a design or product and improve the design using testing, modeling and research.
Sample Indicators:

- *Exhibit an understanding of customer needs in the design process.*

ST-ET 5.3: Demonstrate the ability to record and organize information and test data during design evaluation.
Sample Indicators:

- *No Sample Indicators.*

6. Apply the knowledge learned in STEM to solve problems.

ST-ET 6.1: Apply the use of algebraic, geometric, and trigonometric relationships, characteristics and properties to solve problems.
Sample Indicators:

- *Evaluate mathematical solutions for reasonableness.*
- *Using appropriate data collection and statistical analysis methods, display the data as a means to make a decision.*

ST-ET 6.2: Apply the process and concepts for science literacy relative to engineering and technology.
Sample Indicators:

- *Identify, analyze, and solve defined engineering technology problems.*
- *Conduct, analyze, and interpret experiments.*

ST-ET 6.3: Exhibit the ability to select, apply and convert systems of measurement to solve problems.
Sample Indicators:

- *Conduct standard tests and measurements.*
- *Apply scalar and vector quantities as applied to physical systems, such as the relationship between position, velocity and acceleration.*

ST-ET 6.4: Apply basic laws and principles relevant to engineering and technology.
Sample Indicators:

- *No Sample Indicators*

ST-ET 6.5: Explain relevant physical properties of materials used in engineering and technology.
Sample Indicators:

- *Describe the relationships between amplitude, wavelength, frequency, period and speed of a wave.*

ST-ET 6.6: Apply and create appropriate models, concepts, and processes for an assigned situation, and apply the results to solving the problem.
Sample Indicators:

- *No Sample Indicators*

ST-ET 6.7: Explain the impact of assumptions, initial conditions, boundary conditions and other constraints on solutions to the problem.
Sample Indicators:

- *No Sample Indicators*

ST-ET 6.8: Apply Newton's Laws of Motion to analyze static and dynamic systems with and without the presence of external forces.
Sample Indicators:

- *Use the laws of conservation of energy, charge, and momentum to solve a variety of problems involving mechanical, fluid, chemical, biological, electrical and thermal systems.*
- *Show how the relationships between energy, work, and power can be used to solve a variety of problems involving mechanical, fluid, electrical and thermal systems.*
- *Apply the principles of ray optics to describe reflection and refraction of light.*

ST-ET 6.9: Explain the relationships between scientific theory, principles and laws in engineering and technology.
Sample Indicators:

- *No Sample Indicators*

Science and Math Career Pathway (ST-SM)

1. Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.

ST-SM 1.1: Apply science and mathematics concepts and principles to resolve plans, projects, processes, issues or problems through methods of inquiry.
Sample Indicators:

- *No Sample Indicators*

ST-SM 1.2: Use the skills and abilities in science and mathematics to access, share, and use data to develop plans, processes, projects and solutions.

Sample Indicators:

- *No Sample Indicators*

ST-SM 1.3: Use the skills and abilities in science and mathematics to integrate solutions related to technical or engineering activities using the content and concepts related to the situations.
Sample Indicators:

- *No Sample Indicators*

ST-SM 1.4: Explain the role of modeling in science and engineering.
Sample Indicators:

- *Discuss the importance of modeling to science and technology.*

ST-SM 1.5: Explain the use of models and simulation in hypothesis testing (i.e., the scientific method).
Sample Indicators:

- *No Sample Indicators*

ST-SM 1.6: Communicate with others on inquiry or resolution of issues/problems in the global community.
Sample Indicators:

- *No Sample Indicators*

2. Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.

ST-SM 2.1: Demonstrate the ability to recognize cause and effect when faced with assigned projects or issues.
Sample Indicators:

- *No Sample Indicators*

ST-SM 2.2: Recognize measurable attributes in units, objects, systems and processes in assigned activities.
Sample Indicators:

- *No Sample Indicators*

ST-SM 2.3: Organize data and the consequences of the problems or issues, and research the material placing it in manageable formats.
Sample Indicators:

- *No Sample Indicators*

ST-SM 2.4: Predict the outcomes based on data collected in a project or experiment.
Sample Indicators:

- *No Sample Indicators*

ST-SM 2.5: Defend one's position based on collected facts and data supporting plans, processes and/or projects.
Sample Indicators:
- *No Sample Indicators*

ST-SM 2.6: Apply the Scientific Method to projects as assigned.
Sample Indicators:
- *No Sample Indicators*

ST-SM 2.7: Explain the characteristics and differences between science and pseudoscience.
Sample Indicators:
- *No Sample Indicators*

ST-SM 2.8: Draw a conclusion when confronted with data or observations that focus on the observed plans, processes, or projects at hand.
Sample Indicators:
- *No Sample Indicators*

ST-SM 2.9: Analyze change as a result of data differences and changing environmental values.
Sample Indicators:
- *No Sample Indicators*

ST-SM 2.10: Research a topic, collect data, analyze the data and draw conclusions from the results.
Sample Indicators:
- *No Sample Indicators*

ST-SM 2.11: Use qualitative and quantitative skills to conduct a simple scientific survey; use the data to draw a conclusion based on the analysis.
Sample Indicators:
- *No Sample Indicators*

3. Analyze the impact that science and mathematics has on society.

ST-SM 3.1: Evaluate the impact of science on society based on products and processes used in the real world.
Sample Indicators:
- *No Sample Indicators*

ST-SM 3.2: Evaluate the impact of mathematics on society based on products and processes used in the real world.
Sample Indicators:
- *No Sample Indicators*

ST-SM 3.3: Research how science and mathematics influence the professions and occupations supported by the STEM Career Cluster.
Sample Indicators:

- *No Sample Indicators*

4. Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

ST-SM 4.1: Demonstrate and use effective critical thinking and reasoning skills by making and testing conjectures, drawing logical conclusions and justifying thinking.
Sample Indicators:

- *No Sample Indicators*