

# **Mechanical Engineering**

(Career Readiness Challenge)

## **Team 1011T**

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Mechanical engineering is a broad field that involves designing, developing, and testing various mechanical and thermal devices and systems. These can include engines, machines, manufacturing equipment, and other products and systems essential to modern life. As such, mechanical engineering heavily relies on the engineering design process as a crucial tool for systematically identifying and solving problems and ensuring that the solutions developed are efficient, safe, and effective. An engineering design process is a structured problem-solving approach used in many fields, including engineering, architecture, and product design. It is a cyclical process that typically includes the following steps:

**Define the problem:** The first step in the engineering design process is to identify and clearly define the problem that needs to be solved. This can involve researching the background of the problem and clearly specifying the requirements and constraints of the design. For example, a problem to be solved in mechanical engineering could be designing a machine that can produce a certain product at high speed and with high accuracy.

**Research and generate ideas:** In this step, the engineer will research and generate ideas for possible solutions to the problem. They will gather information and inspiration from various sources, such as previous designs, industry standards, and technological advances. For example, a mechanical engineer might research different types of machines currently used to produce similar products and consider how they might be adapted or improved.

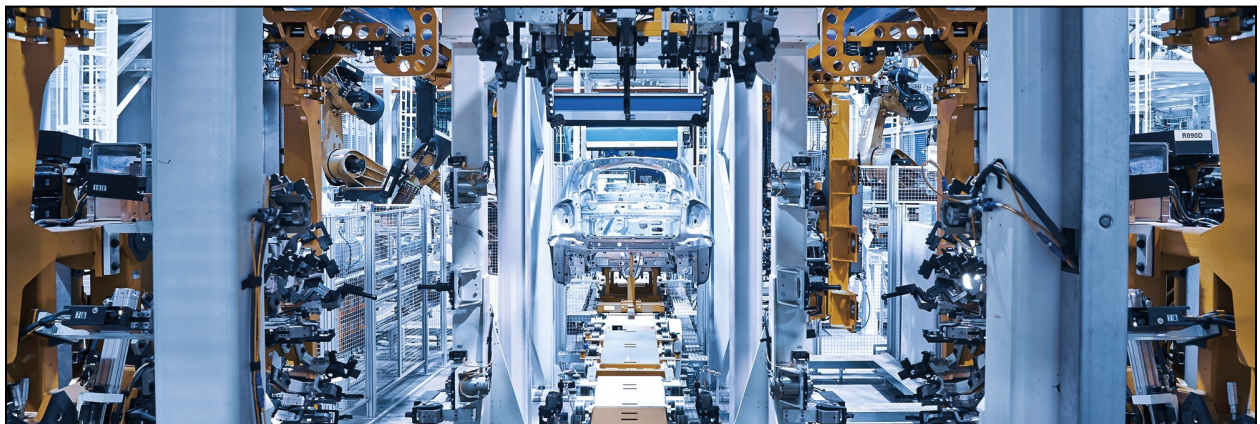
**Develop possible solutions:** In this step, the engineer will develop a number of possible solutions to the problem and create detailed plans and drawings for each one. They will use their knowledge of mechanical systems, materials, and manufacturing processes to create functional, efficient, and cost-effective designs. For example, a mechanical engineer might develop several designs for a high-speed production machine, each with unique features and advantages.

Evaluate and select the best solution: The engineer will evaluate the different solutions and select the best one based on factors such as cost, safety, feasibility, and performance. This step involves analyzing the pros and cons of each solution and comparing them to the requirements and constraints of the design. For example, a mechanical engineer might evaluate the cost and energy efficiency of different production machine designs, and select the one that is the most cost-effective and energy efficient.

Implement the solution: Once the best solution has been selected, the engineer will build and test a prototype or final product. They will use their manufacturing, testing, and troubleshooting skills to ensure that the final product meets the requirements and constraints of the design.

Evaluate the final product: The engineer will evaluate the final product and make necessary adjustments and improvements. This step can involve testing the final product, collecting feedback, and analyzing data in order to identify any issues that need to be addressed.

Using the engineering design process, mechanical engineers can create solutions to complex problems that are safe, efficient, and cost-effective. They can also work more efficiently and effectively by following a structured approach to problem-solving. This makes them important to many industries, including manufacturing, energy, transportation, and healthcare. In applying these steps in their work, mechanical engineers will often use a modified version of the engineering design process that may add additional steps or slightly different implementation of the above steps, depending on the specific project, company or industry.



Though the engineering design process of a mechanical engineer is very similar to what our team does when designing our robot or building a mechanical mechanism for the competition, it differs in the scale and complexity of the designs. A mechanical engineer may design parts or systems for various applications such as aerospace, automotive, medical equipment, industrial machinery, etc. The design process typically involves creating detailed

drawings and specifications, analyzing the design using engineering principles and computer simulations, and testing the design through physical prototypes and simulations. The design process may take months or even years. On the other hand, a VEX Robotics team typically designs a robot to compete in a specific competition. The design process usually involves creating a rough design, building a prototype, testing and debugging the robot, and then refining the design based on the results. The design process may take weeks or months. The design process for a mechanical engineer is generally more formal and time-consuming, and the designs tend to be more complex and varied, while the design process for a VEX Robotics team is more focused, shorter and simpler.



In conclusion, an engineering design process is a critical tool for many professionals in STEM fields, including mechanical engineers who use the process we do in VEX. Participation in VEX Robotics can also provide valuable experience in design, problem-solving, and teamwork, which can be applied to many STEM careers. Participation in VEX Robotics is great preparation for a future career in STEM fields as it exposes students to apply the Engineering Design Process to real-world problems and works on teamwork, time management and presentation skills. One STEM career that heavily relies on the engineering design process is mechanical engineering.