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# Unit 3 – Reverse Engineering

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## Preface

Reverse Engineering is an important process in the redesign of products. Designers get an opportunity to breakdown and analyze each part of the product to see how they operate. The information gathered during this process can help the designer or team determine what they can do to make the product better and optimize manufacturing potential to increase company profits.

The process of Reverse Engineering involves analyzing the products function, structure, and visual elements. In this unit, you will get an opportunity to visit all three aspects of a product. You will use the information learned during these procedures and suggest possible changes you would make to improve a product.

## Concepts

1. Visual design principles and elements constitute an aesthetic vocabulary that is used to describe an object.
2. Engineers perform reverse engineering on products to study their visual, functional, and structural qualities.
3. Operational conditions, material properties, and manufacturing methods help engineers determine the material makeup of a design.
4. Objects are held together by means of joinery, fasteners, or adhesives.
5. Engineers analyze designs to identify shortcomings and opportunities for innovation.
6. Engineers use reference sources and computer-aided design (CAD) systems to calculate the mass properties of designed objects.

## Essential Questions

### Lesson 3.1 Visual Analysis

1. What is meant by the phrase *The Language of Design*?
2. What are visual design elements?
3. What are visual design principles?
4. What makes a designed object aesthetically pleasing or eye catching?
5. Why do people associate a design's aesthetic value with its functional efficiency and structural resilience?
6. How does the gestalt principle explain the way in which the human mind perceives visual patterns?
7. What is *graphic design* and how is it different from *product design*?

8. What information can be gained from *demographic research* and why is it used in marketing?
9. Why must a graphic designer understand the demographics of the intended audience?
10. How are visual design principles and elements used to capture a consumer's attention?

### Lesson 3.2 Functional Analysis

1. What is the purpose of reverse engineering?
2. What is the difference between a product's visual and functional qualities?

### Lesson 3.3 Structural Analysis

1. What are the differences between joinery, fasteners, and adhesives?
2. What is the difference between an adhesive and a solvent?
3. How does a design's material makeup impact the joinery, fasteners, and adhesive methods used to hold its components together?
4. What factors influence the selection of a material for use in a design?
5. For what reasons might a designer need to know the mass, volume, and surface area of an object?
6. What is the difference between an object's mass and an object's weight?
7. What is the difference between force and stress?

### Lesson 3.4 Product Improvement by Design

1. What is the purpose of reverse engineering a product?
2. What practices are associated with group brainstorming?
3. Why is brainstorming as a team important when modifying or improving a product?
4. What are some factors to consider when enhancing an existing product?
5. What function does the design brief serve in the design process?
6. What are the elements of a technical report?

## Lessons

[Lesson 3.1 Visual Analysis](#)

[Lesson 3.2 Functional Analysis](#)

[Lesson 3.3 Structural Analysis](#)

[Lesson 3.4 Product Improvement by Design](#)