

Design and Fabrication 1202

Unit 1 - Introduction to Design

- Topic 1-1: History of Design (1 hour)
- **Topic 1-2: The Design Process (4 hours)**
- Topic 1-3: Social/Environmental Considerations (2 hours)
- Topic 1-4: Design in Fabrication (2 hours)
- Topic 1-5: Careers in Design (1 hour)
- This unit introduces students to the engineering design process and provides the basis for the remaining units.
- Students will review the history of the design process and examine how it has evolved. You will also examine various fabrication techniques and discover how design and fabrication are interrelated.

Topic 2 – The Design Process

The Design Process, is a methodology that can facilitate technological problem-solving. It is an iterative process that begins with an identified need or opportunity and progresses through a series of pre-defined steps to a final implemented solution.



The Steps

Before you begin

Opportunities (Need Identification)

- Engineering design activity always occurs in response to a human need. Before you can develop a problem definition statement for a design problem, you need to recognize the need for a new product, system, or machine.

Step 1 - The Design Brief

A critical step in design is to define the problem by identifying the design objectives or goals. For each objective, criteria that quantify or qualify the design objective must be assigned.

- A Table may be used to for organization

Step 2 - Investigative Research

- Before you can go further in the design process, you need to collect all the information available that relates to the problem.

Consider the following:

- Suitable materials for your project.
- Safety factors related to your design problem.
- Write letters to manufacturers / shops.
- Research using the library, Internet / CD-ROMs/DVDs.
- Carry out a survey /questionnaire and present the results as a pictogram/table of results.
- Collect pictures of existing products - photographs/catalogue pictures.

Step 3 - Generate Options

- The next step in the design process begins with creativity in generating new ideas that may solve the problem. Start with existing solutions and then tear them apart-find out what's wrong with those solutions and focus on how to improve their weaknesses.
- Draw at least 3 different ideas, with notes.

Step 4 - Select Best Option

Once you've conceived alternative solutions to your design problem, you need to analyze those solutions and then decide which solution is best suited for implementation.

Use a table, "Decision Matrix", to indicate whether or not each of your alternative solutions meets the solution objectives by writing (Y)es or (N)o in the space provided.

Step 5 – Develop the Solution

- The best solution option is developed in detail at this stage. This often involves various engineering calculations and the development of detail and assembly drawings.
- Following this, a physical or virtual prototype is usually produced and tested to ensure functional compliance.

Step 6 - Evaluation Redesign

- Evaluate your product. State the good and bad points. Does the solution answer the design brief?
- Prototype testing will often reveal the need for improvement in a number of areas. The need to minimize weight and reduce production costs, for example, are sometimes identified at this stage. The design process essentially repeats at this stage in an effort to optimize the design – hence, design becomes a cyclic process.