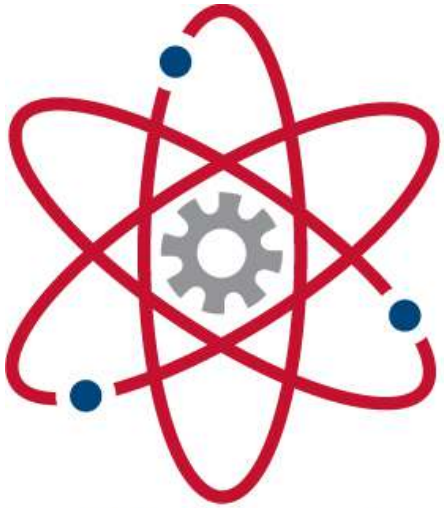


PROJECT LEAD THE WAY

PLTW

Igniting imagination and innovation through learning.

Engineering Definitions

ENGINEERING

What is Engineering?

Engineering is the application of mathematics and scientific principles to better or improve life.

ENGINEERS

What is an engineer?

An engineer is a person who is trained in and uses technological and scientific knowledge to solve practical problems.

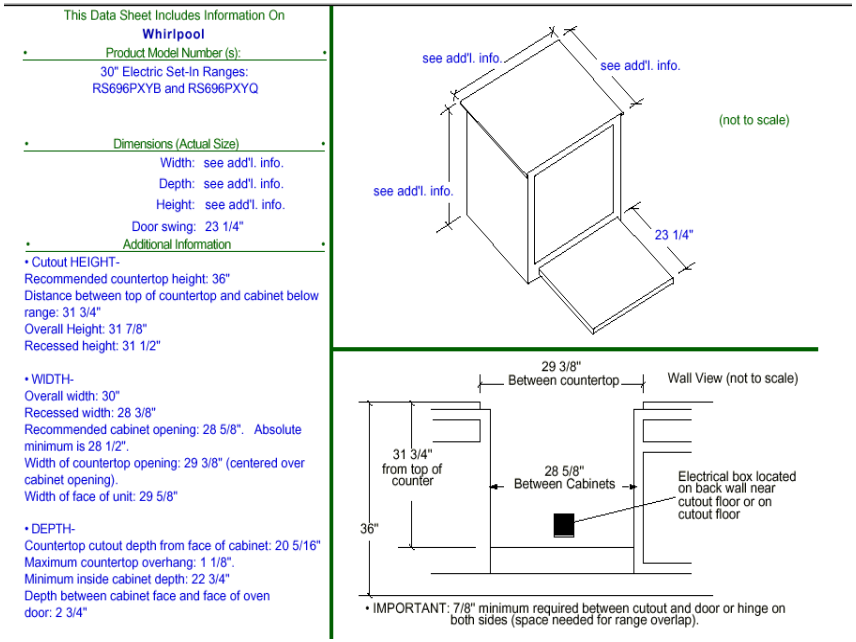
See Engineers Greatest Achievements www.greatachievements.org **and Engineering Girl** www.engineergirl.org

What Do Engineers Do?

- Research
- Development
- Design
- Supervise
- Manage

RESEARCH

The purpose of research is to:



This Data Sheet Includes Information On

Whirlpool

• Product Model Number (s): •

30" Electric Set-In Ranges:
RS696PXYB and RS696PXYQ

• Dimensions (Actual Size) •

Width: see add'l. info.
Depth: see add'l. info.
Height: see add'l. info.
Door swing: 23 1/4"

• Additional Information •

• Cutout HEIGHT-
Recommended countertop height: 36"
Distance between top of countertop and cabinet below range: 31 3/4"
Overall Height: 31 7/8"
Recessed height: 31 1/2"

• WIDTH-
Overall width: 30"
Recessed width: 28 3/8"
Recommended cabinet opening: 28 5/8". Absolute minimum is 28 1/2".
Width of countertop opening: 29 3/8" (centered over cabinet opening).
Width of face of unit: 29 5/8"

• DEPTH-
Countertop cutout depth from face of cabinet: 20 5/16"
Maximum countertop overhang: 1 1/8".
Minimum inside cabinet depth: 22 3/4"
Depth between cabinet face and face of oven door: 2 3/4"

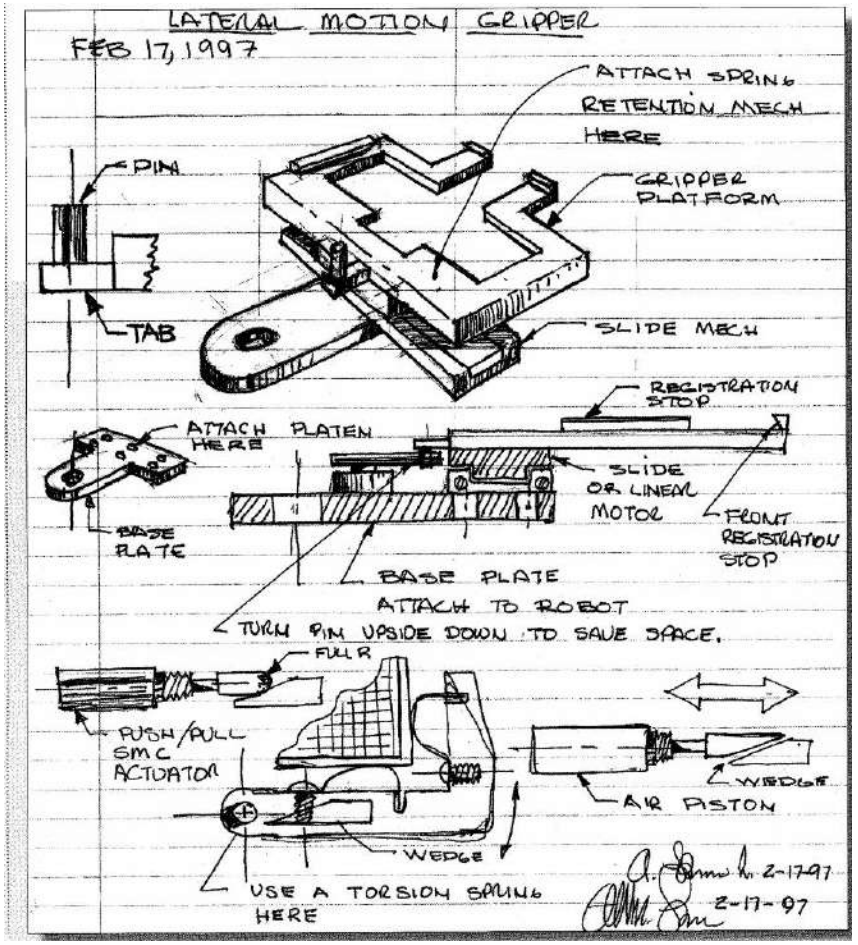
- Employ basic scientific principles in the discovery and application of new knowledge that will have commercial or economic value
- Develop existing or invent new products
- "Discover truths" about a subject

DEVELOPMENT

- Is the actual construction, fabrication, assembly, layout, and testing of scale models, pilot models, and experimental models for pilot processes or procedures that will work
- Does not deal exclusively with new discoveries but involves using well-known principles and employing existing processes or machines to perform a new or unusual function
- Can involve searches in library, manufacturing literature and patents for existing ideas

DESIGN

- Anticipate all manner of problems that the user may create in the application of a machine, or use of a structure
- Prevent user errors, accidents, and dissatisfaction
- Requires a mastery of basic engineering principles and mathematics, and an understanding of the capabilities of machines

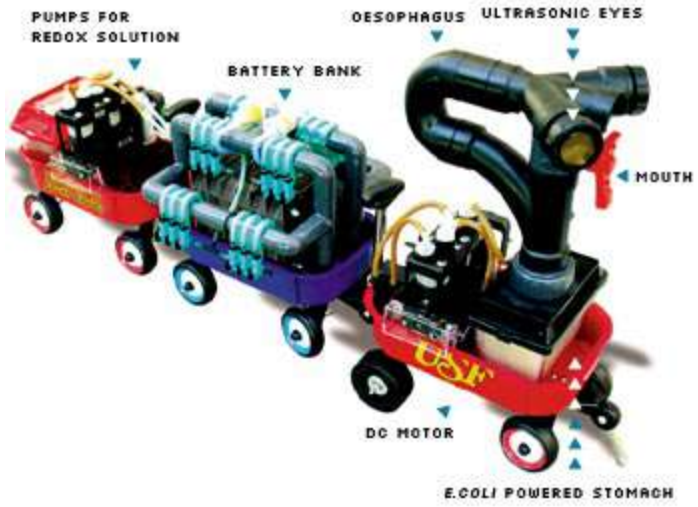


SUPERVISE

- Must take the design engineer's drawings and supervise the assembly of the object as it was conceived
- Works closely with the technicians, mechanics, and laborer
- Associated with the process of estimating and bidding for competitive jobs
- Employ knowledge of structural materials, fabricating processes and general physical principles to estimate both time and cost to accomplish a task

What Other Functions Do Engineers Perform?

PRODUCTION AND CONSTRUCTION:



- "Project Engineer" controls other engineers on job
- Preparation of schedules for production or construction
- Must have knowledge of engineering principles and visualization skills

What Functions Do Engineers Perform?

OPERATIONS OR PLANT:

- Responsible for the maintenance of the building, equipment, grounds, and utilities
- Varies from routine tasks to setting up and regulating the most complex automated machinery
- Wide knowledge of several branches of engineering
- Compare costs of operating under various conditions and set schedules for machines so that the best use will be made of them
- Evaluate new equipment and retire old equipment
- Must be able to work with people and machines and know what results to expect from them

What Functions Do Engineers Perform?

SALES:

- Presenting the use of new products to prospective customers
- Intimate knowledge of the principles involved, to educate possible users so that a demand can be created
- Ability to “talk their language” and answer technical questions
- Must be familiar with the operations of a customer’s plant
- Be able to show how their product will fit into the plant
- Ability to show the economics involved to convince the customer to buy
- Knowing applications in which no apparatus is available and reporting back to the company that a need exists for R& D

What Functions Do Engineers Perform?

MANAGEMENT:

Recent surveys show that the trend today is for corporate leaders in the United States to have a background in engineering and science

- Using the capabilities of the company to the best advantage to produce a desirable product in a competitive economy
- Make decisions involving:
  - equipment in the plant
  - the labor force
  - financial assets

What Functions Do Engineers Perform?

MANAGEMENT:

- Business side of the operation that the engineer usually must work harder to develop

- Concerned with long-range effects of policy decisions mainly financial, legal, and labor aspects

Fields of Engineering

Aeronautical Engineering

- Deals with flight and the movement of fluids in the earth's atmosphere.
- Specializing in work areas centered on:
  - aerodynamics
  - propulsion
  - controls
  - structure

Aerospace and Astronautical Engineering

- Deals with environments not found on earth
- Specialization in work areas centered on:
  - propulsioncryogenics
  - materialsnavigation
  - thermodynamicscosmic radiation

Agricultural Engineering

- Blends engineering knowledge with soil systems, land management, and environmental control .
- Has Five specialty Fields:

1. **Soil & Water Engineering**
2. **Food Engineering**
3. **Power Machinery Engineering**
4. **Structures Engineering**
5. **Electric Power Generation Engineering**

Architectural Engineering

- Works with architects focusing on structural integrity and safety of design
- Structural engineering and this field are very similar, the main difference is the concern for aesthetics

Automotive Engineering

- Design and build all types of vehicles:
  - automobiles
  - Trucks
  - Tractors
  - Bulldozers
  - Motorcycles

Deals with:

- **Engine Design**
- **Structural Design**
- **Tire Design**

Biomedical Engineering

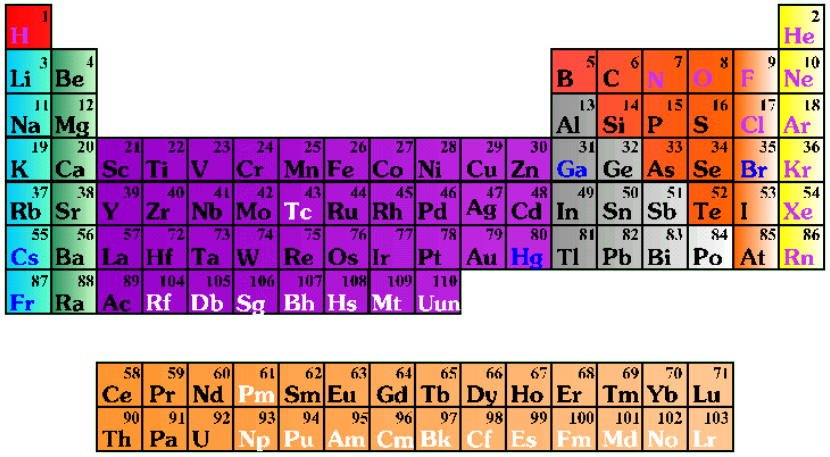
Bridges engineering, physical, and life sciences in identifying and solving medical and health-related problems

Three general divisions:

1. **Bioengineering**
2. **Medical Engineering**
3. **Clinical Engineering**

Chemical Engineering

- Apply scientifically the principles of chemistry, physics, and engineering to design an operation of plants for the production of materials that undergo chemical changes during their processing
- Responsible for new and improved products and processes:
  - new fuels for rockets, reactors, and booster propulsion
  - medicines, vaccines, serum, and plasma
  - plastics, synthetics and textiles



Civil and Construction Engineering

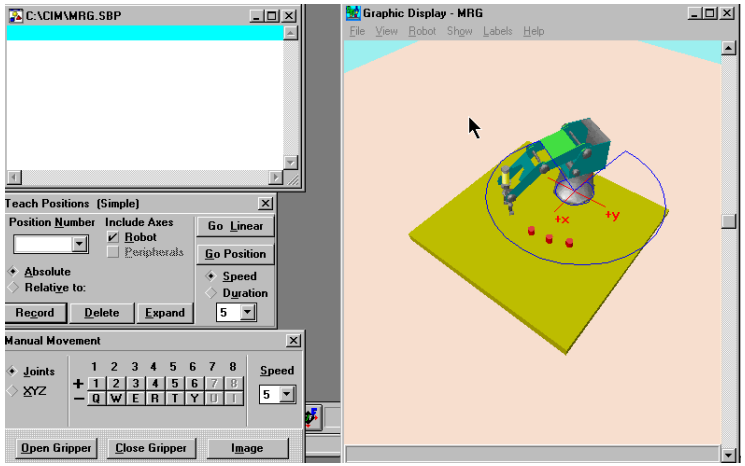
- Plan, design, and supervise the construction of facilities in both the public and private sectors
- Projects vary widely in nature, size and scope:
  - space satelliteslaunch facilities
  - offshore structures
  - bridges
  - buildings
  - highways
  - transit systems
  - dams
  - airports
  - irrigation projects
  - tunnels
  - treatment and distribution facilities for water
  - collection and treatment for wastewater

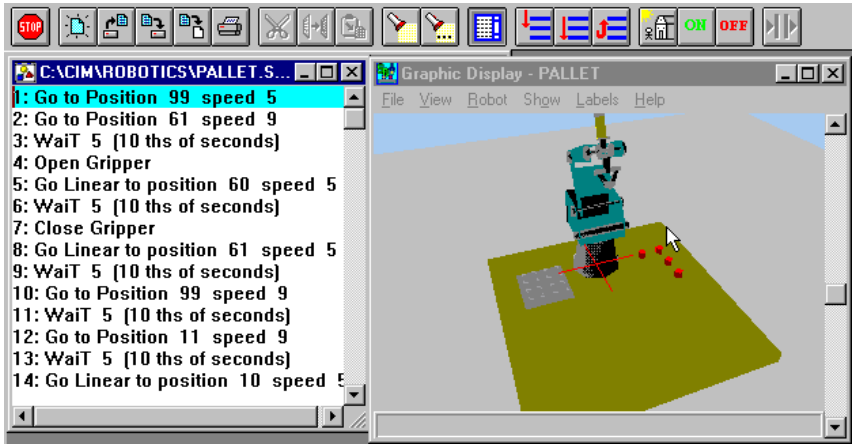
Computer Engineering

- The design and organization of computers:
  - hardware
  - software

Who is the largest consumer of computers today?

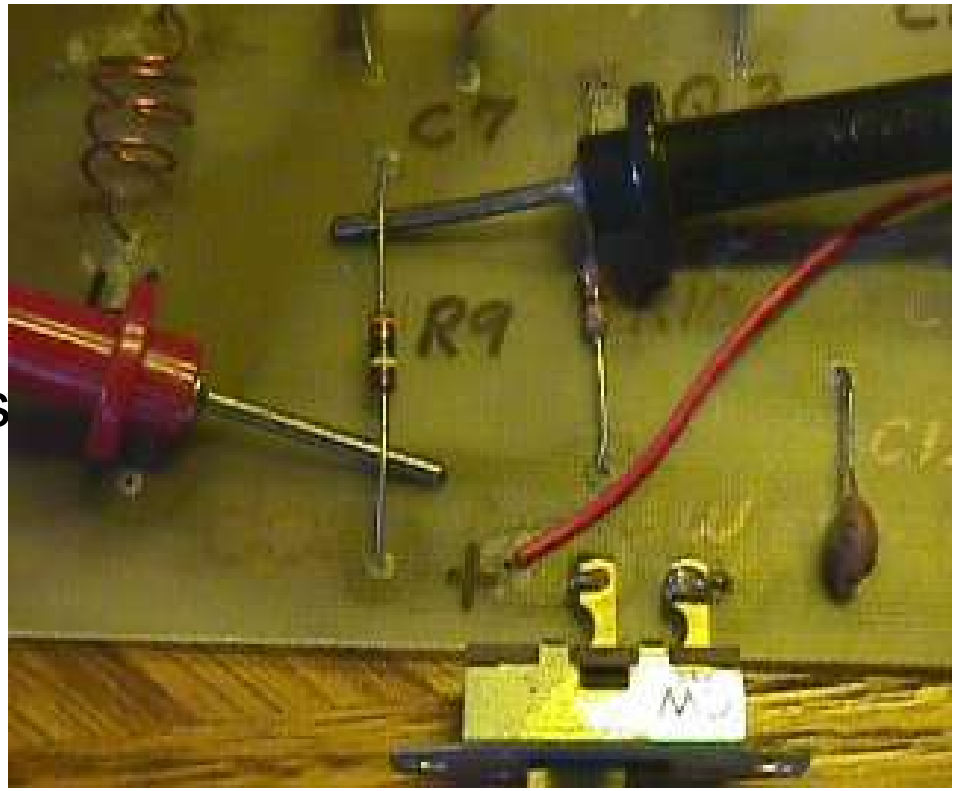
Automotive Industry





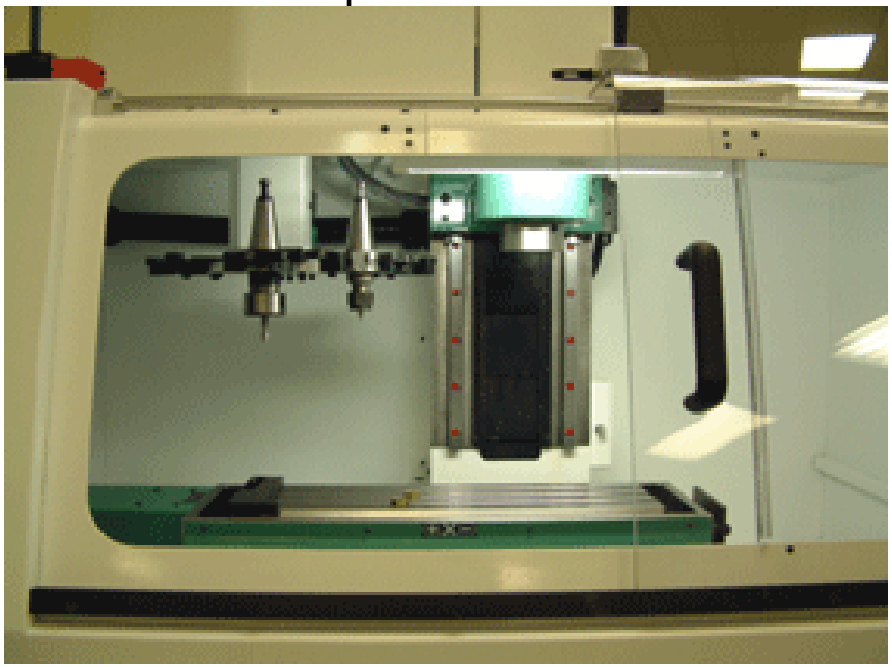
Electrical and Electronics Engineering

- Deals with the motion of electrons in metals
- Work focused on:
  - large electrical systems
  - motors and generators
  - electrical circuits in buildings
  - power transmission systems
  - electrical generation plants

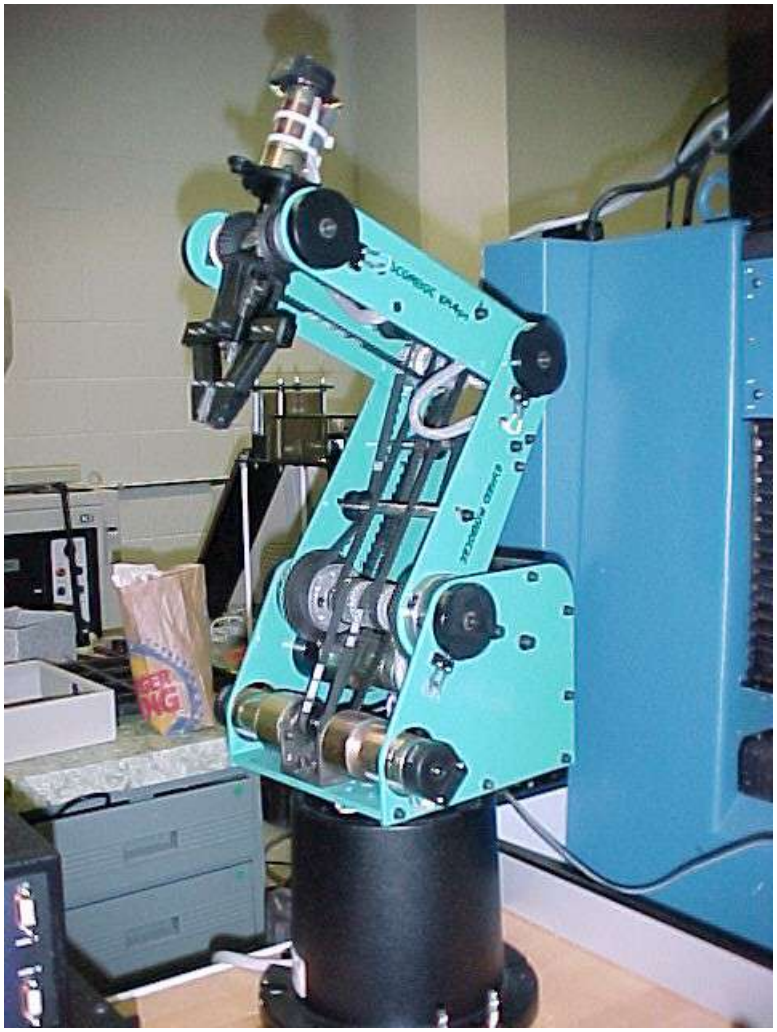


Industrial Engineering

- The design, improvement, and installation of integrated systems of people, materials and energy to produce a product at the lower possible cost
- Deals with:
  - design of systems for the manufacture of products
    - raw materials to machines
    - workforce to operate machinery
    - removal of finished products
    - maintenance of machinery
    - analysis of manufacturing processes for cost



Manufacturing Engineering



- Design of a manufacturing facility for a product or products
- Deals with:
  - physical plant layout
  - use of existing machines or new
  - buy or rent facilities
  - purchase of nonproducing facilities and equipment
  - packaging of product
  - shipping to market

Mechanical Engineering

- Apply the principles of mechanics and energy to the design of machines and devices
- Most often associated with devices that move but includes thermal designs as well as HVAC
- Vibration analysis
- Lubrication
- Gears and Bearing