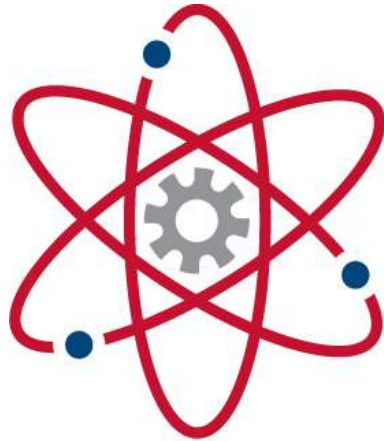




PROJECT LEAD THE WAY

PLTW

Igniting imagination and innovation through learning.

Engineering Disciplines

ENGINEERING

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



Fields of Engineering

- The BIG FOUR fields of engineering include:
 - Chemical
 - Civil
 - Electrical
 - Mechanical
- Most other disciplines are a derivative, combination or extension of one of these

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

1 H																	2 He											
3 Li	4 Be																	5 B	6 C	7 N	8 O	9 F	10 Ne					
11 Na	12 Mg																	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar					
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr											
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe											
55 Cs	56 Ba	57 La	58 Hf	59 Ta	60 W	61 Re	62 Os	63 Ir	64 Pt	65 Au	66 Hg	67 Tl	68 Pb	69 Bi	70 Po	71 At	72 Rn											
87 Fr	88 Ra	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr												

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

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 satellites
 - Launch facilities
 - Offshore structures
 - Bridges
 - Buildings
 - Highways
 - Transit systems
 - Dams
 - Airports
 - Irrigation projects
 - Tunnels
 - Treatment and distribution facilities for water
 - Collection and treatment for wastewater



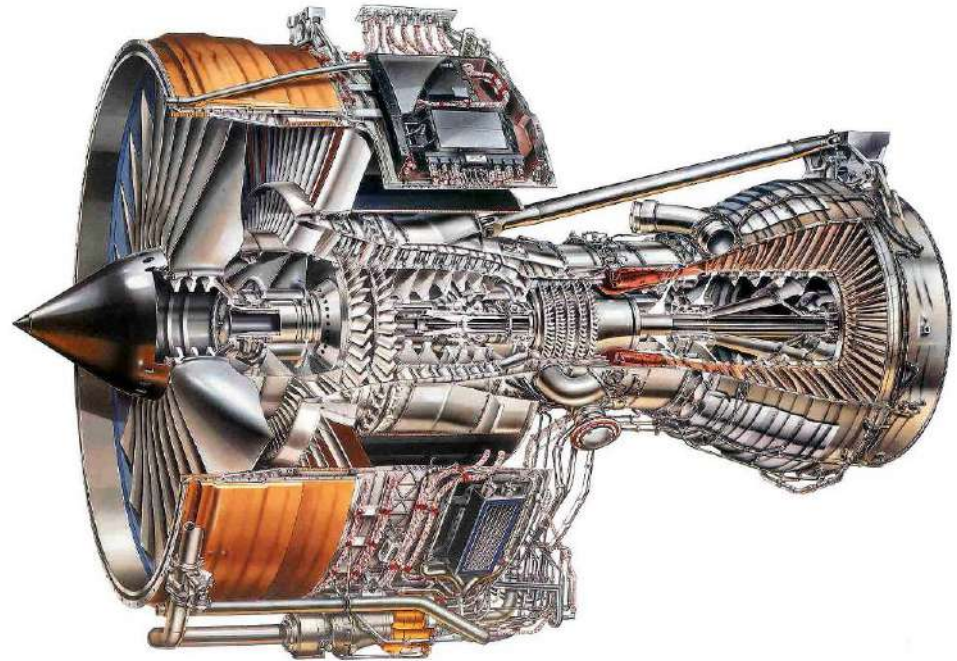
Electrical and Electronics Engineering

- 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



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



More Engineering Disciplines

Aeronautical Engineering

- Deals with flight and the movement of fluids in the earth's atmosphere.
- Specializing in the following work areas:
 - 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

Agricultural engineering blends engineering knowledge with soil systems, land management, and environmental control.

Five specialty fields:

1. Soil and water
2. Food
3. Power machinery
4. Structures
5. Electric power generation



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

Addresses:

- 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

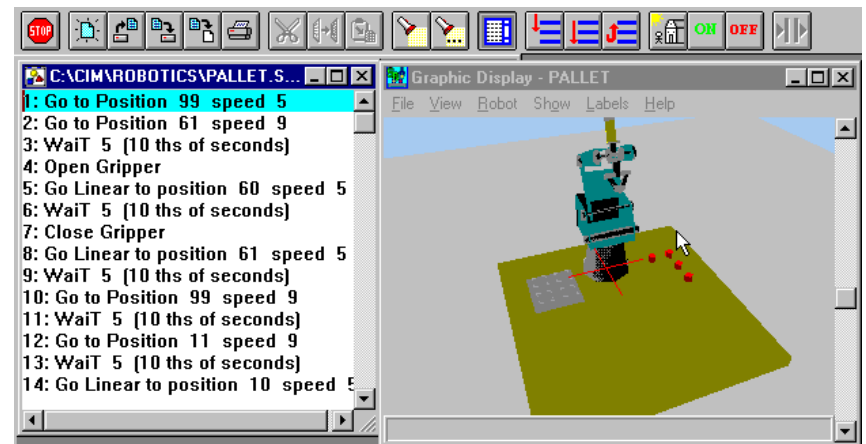
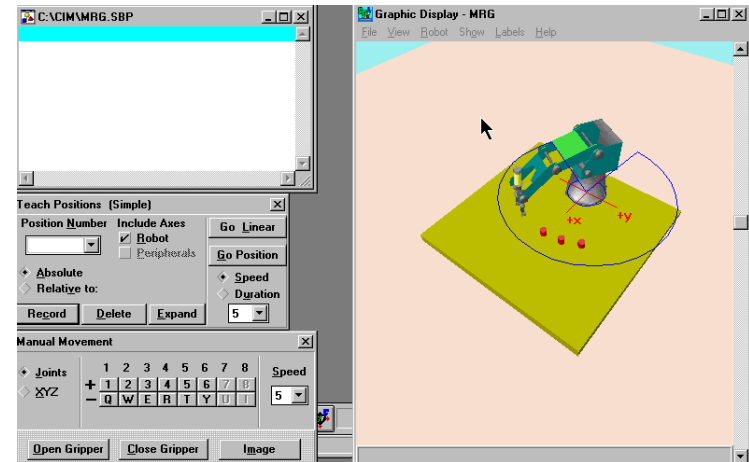


Computer Engineering

- The design and organization of computers:
 - Hardware
 - Software

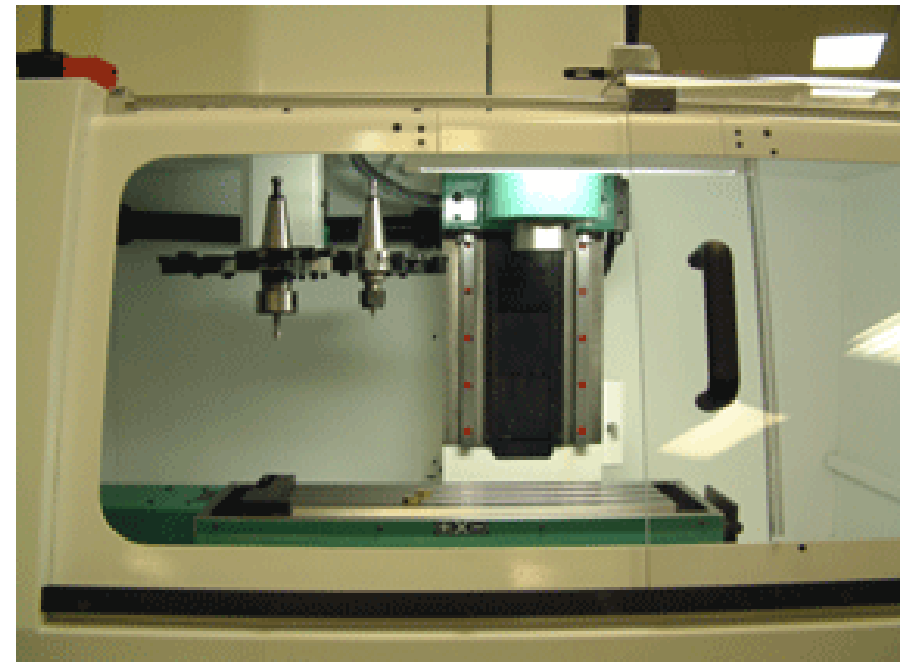
Who is the largest consumer of computers today?

Automotive Industry

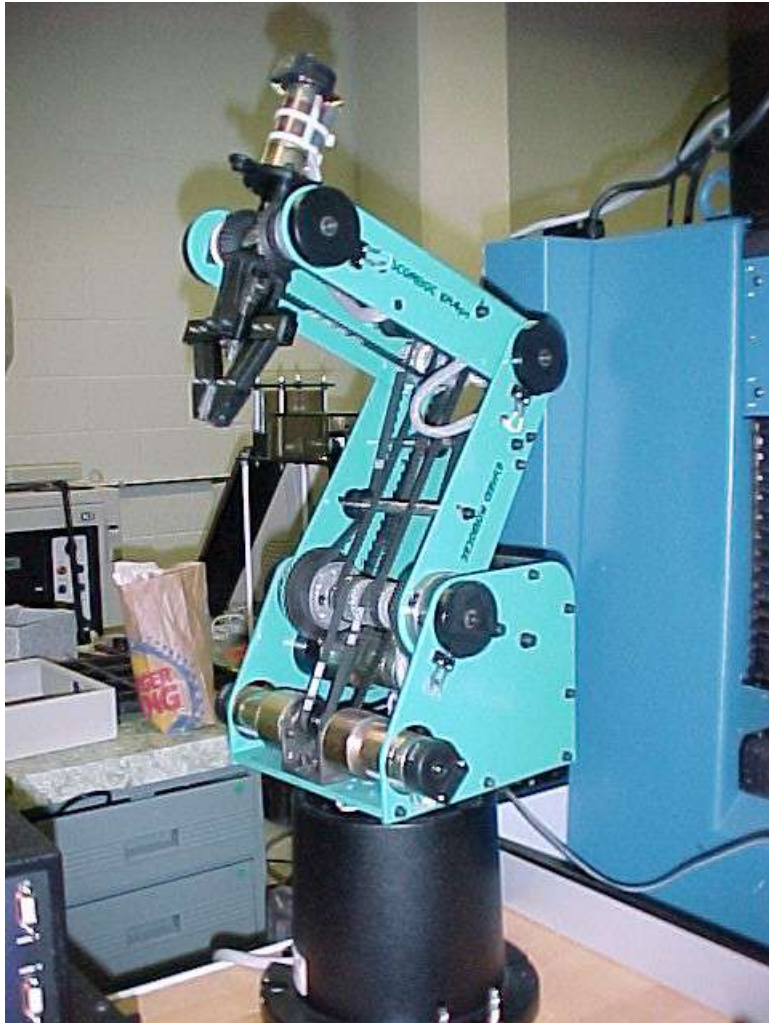


Industrial Engineering

- 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
 - Purchase or rental of facilities
 - Purchase of nonproducing facilities and equipment
 - Packaging of product
 - Shipping to market