1.2 Engineering Disciplines

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Preview

- In the last sequence, engineering was defined and a brief history of engineering was provided

- In this sequence, engineering disciplines (such as mechanical ,electrical, industrial, …) will be described

Engineering Disciplines

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Computer Engineering
- Mechatronics Engineering
- Industrial Engineering
- Aerospace Engineering
- Chemical Engineering
- Biomedical Engineering
- Materials Engineering
- Nuclear Engineering
- Petroleum Engineering
- Architectural Engineering
- Agricultural Engineering

Civil Engineering

- Civil engineering is considered the oldest engineering profession.
- Civil engineers are responsible for constructing large-scale projects such as roads, buildings, airports, dams, water systems, and bridges.
- Civil engineers specialize in construction management, environment, soil and rock analysis, structures, transportation, and water resources.

Mechanical Engineering

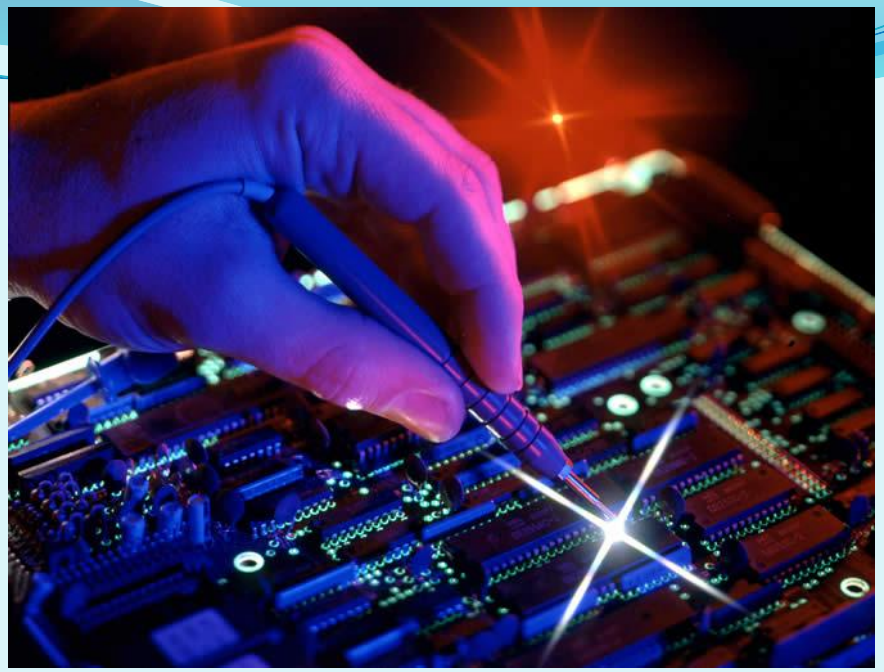
- Mechanical engineers design and develop engines, vehicles, machine tools, heat exchangers, industrial process equipment, heating systems, and air conditioning systems.

- Mechanical engineers specialize in structure and fluid mechanics, materials, and thermodynamics.

Electrical Engineering

- Power Electrical Engineers specialize in power transmission design and build electric generators, transformers, electric motors, and other high-power equipment.

- Communication and Electronics Engineers specialize in information transmission design and build radios, televisions, computers, instrumentation, controllers, and communication equipment.

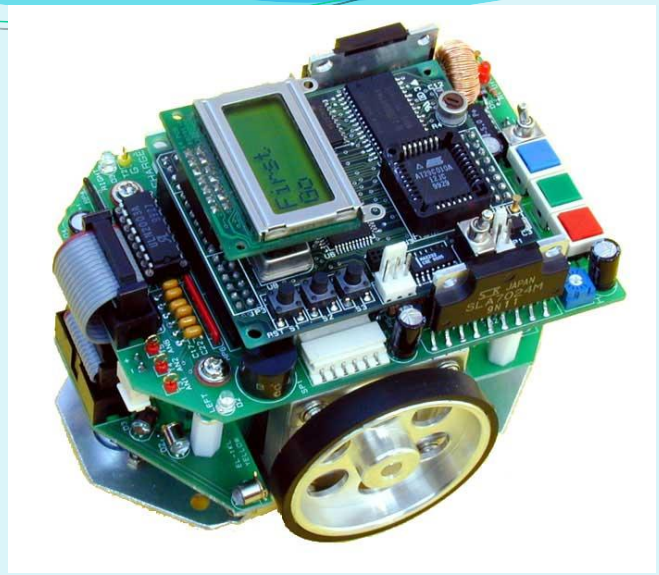


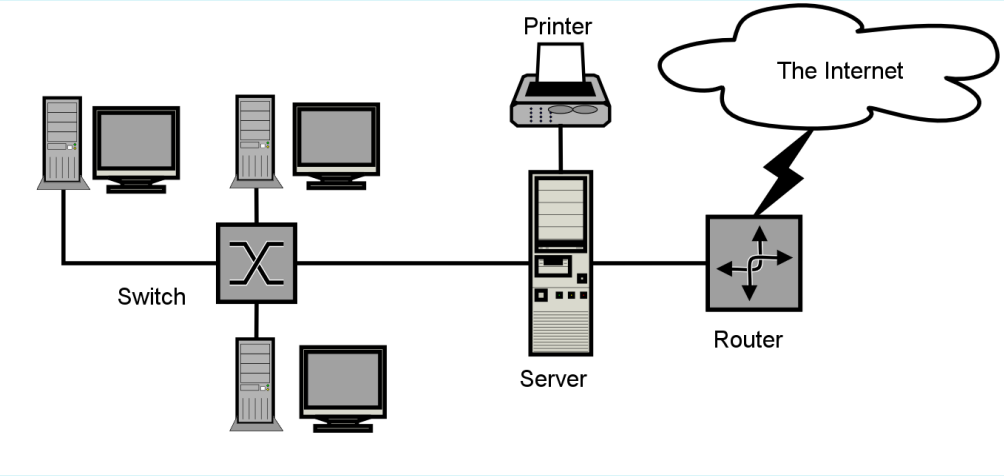

NOKIA
NOKIA

Computer Engineering

- Computer engineers design and build personal & network computers and write applications software.

- Computer engineers specialize in programming, software applications, operating systems, networking, and digital design.




Printer
The Internet
Switch
Server
Router

Mechatronics Engineering

- Mechatronics engineers combine the knowledge of electronic, mechanical, and computer engineers in order to design and build fully integrated engineering systems.

- Mechatronic systems use electronics and computers to control mechanical processes.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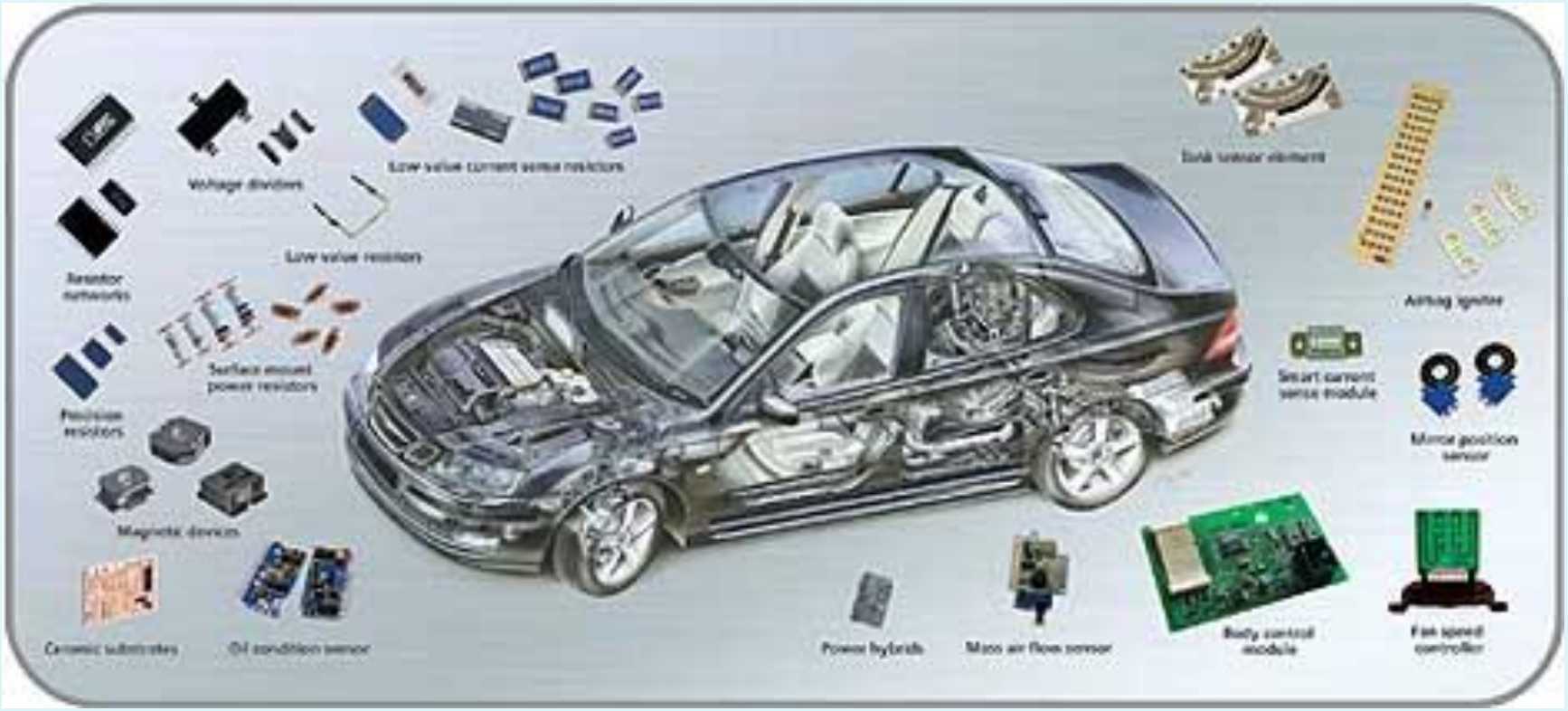

Voltage dividers
Low value current sense resistors
Low value resistors
Surface mount power resistors
Magnetic devices
Ceramic substrates
Oil condition sensor
Power hybrids
Mass air flow sensor
Body control module
Fan speed controller
Smart current sense module
Mirror position sensor
Airbag igniter

Industrial Engineering

- Industrial engineers combine engineering with management.
- Industrial engineers develop, design, install, and operate integrated systems of people, machinery, and information to produce either goods or services.
- Industrial engineers specialize in manufacturing, facility design, ergonomics, management, and quality control.

INDUSTRIAL ENGINEERING

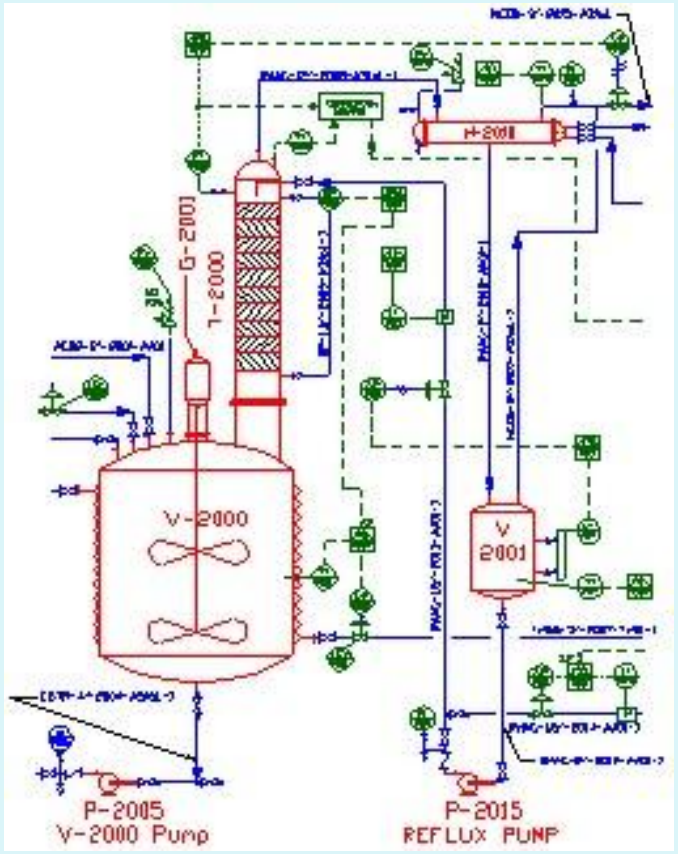
Aerospace Engineering

- Aerospace engineering is considered a branch of mechanical engineering
- Aerospace engineers design and build flight vehicles and automobiles.
- Aerospace engineers work with aerodynamics, structural design & materials selection, propulsion systems , and guidance & control systems

Chemical Engineering

- Chemical engineers process raw materials into refined products.

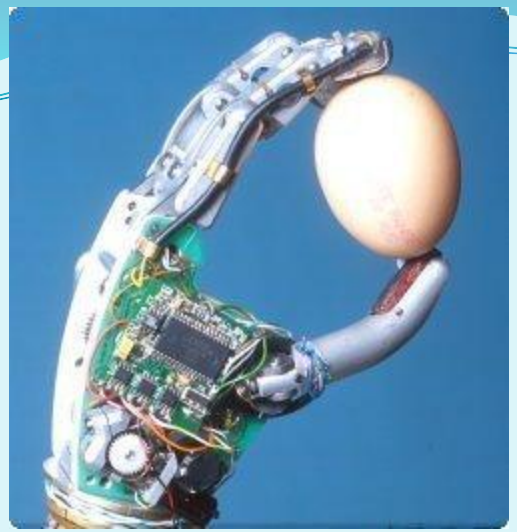
- Chemical engineers work with a variety of products such as: fuels, plastics, fibers, food products, paper products, and consumer products.

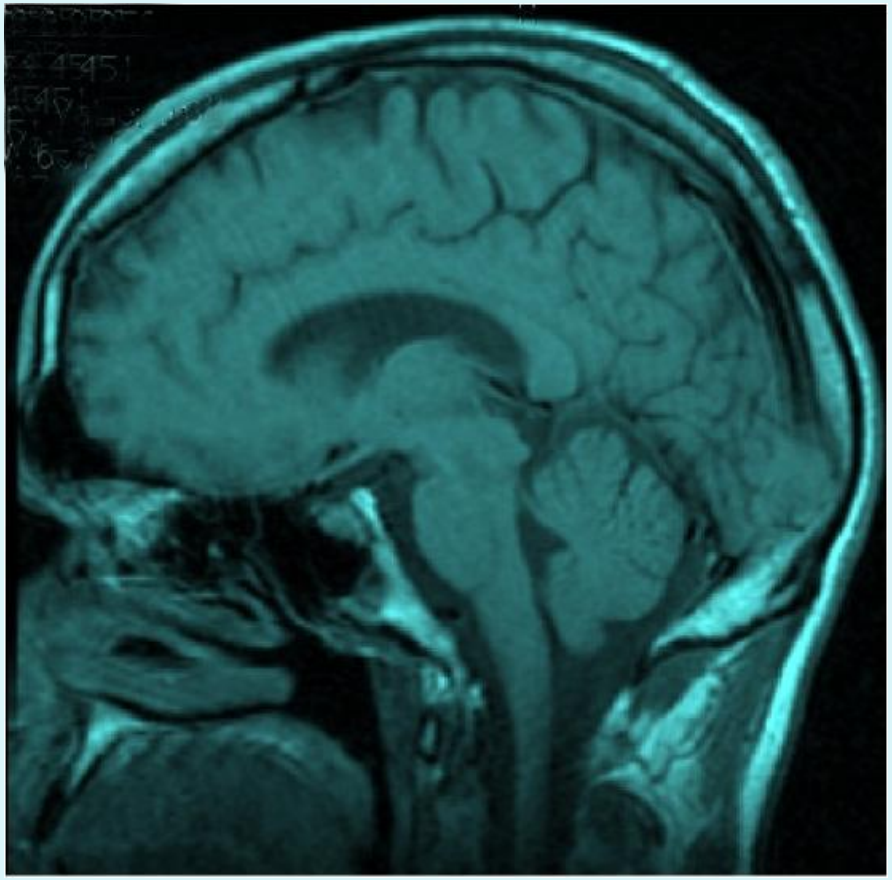

H-2001
G-2001
T-2000
V-2000
V
2001
P-2005
V-2000 Pump
P-2015
REFLUX PUMP

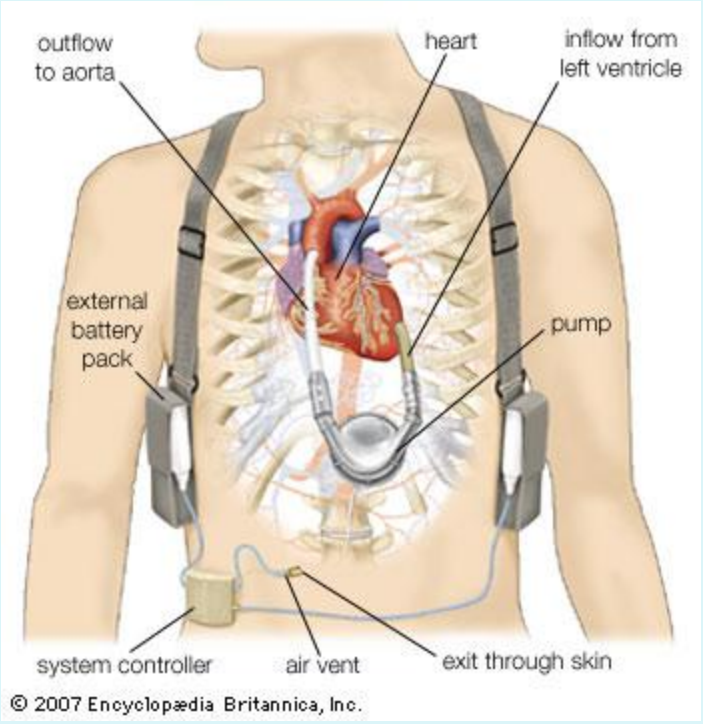
Biomedical Engineering

- Biomedical engineers combine traditional engineering fields with medicine and human physiology.

- Biomedical engineers specialize in biomaterials, biomechanics, and medical devices.






outflow to aorta
heart
inflow from left ventricle
external battery pack
pump
system controller
air vent
exit through skin
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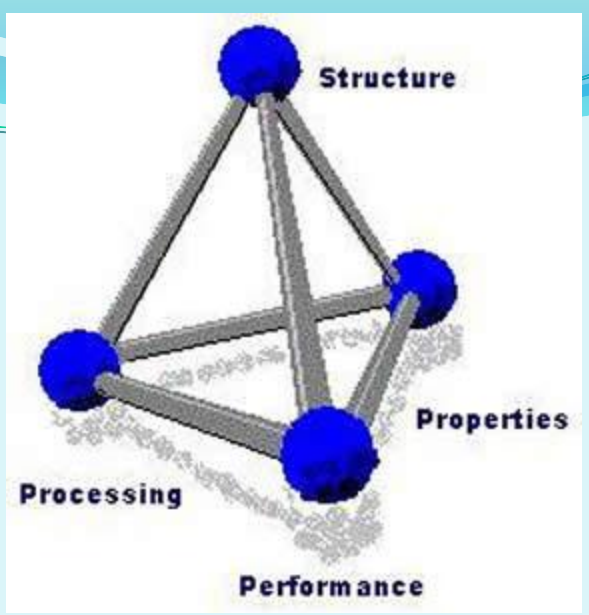
Materials Engineering

- Material engineers are concerned with obtaining the materials required by modern societies.

- Material engineers develop advanced materials (ceramics, plastics, metals, and polymers) for useful applications.


System 3R

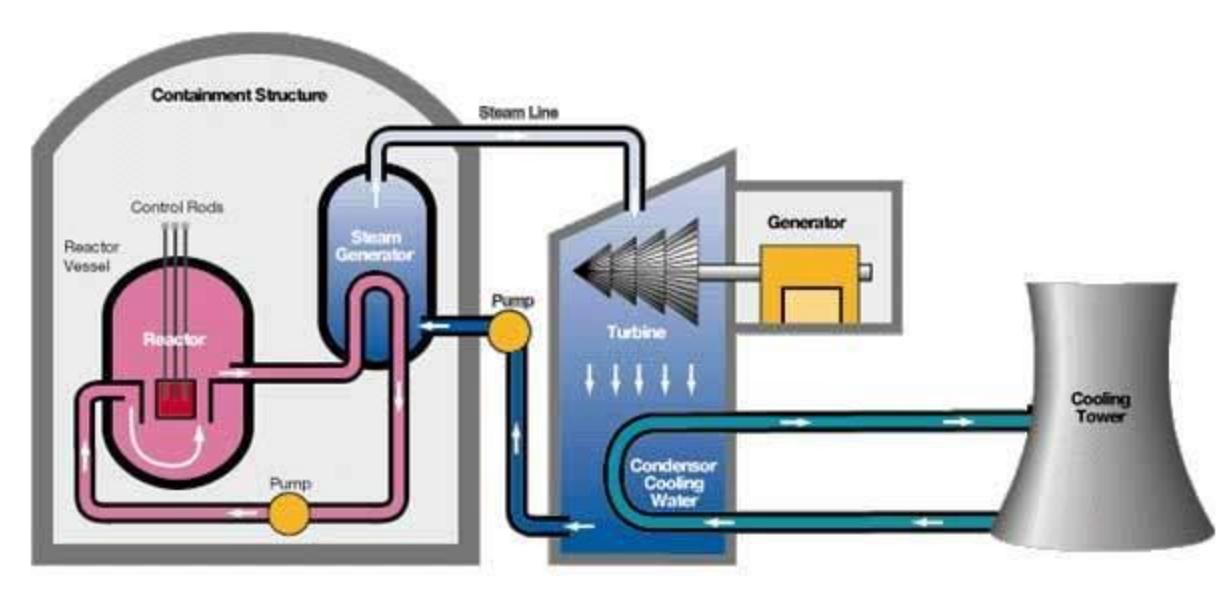

Structure
Properties
Processing
Performance

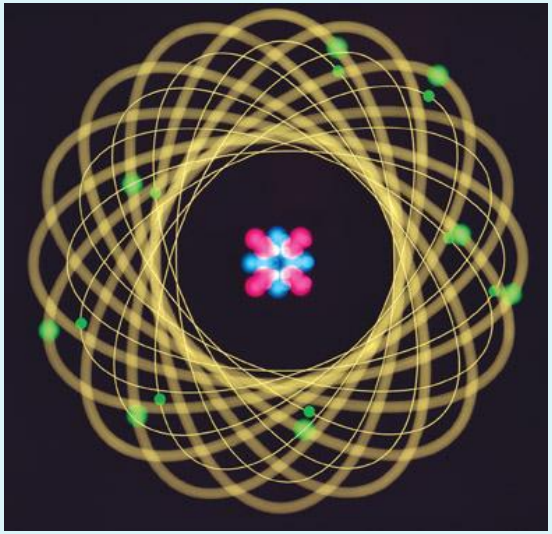

http://www.bam.de

Nuclear Engineering

- Nuclear engineers design systems that employ nuclear energy, such as nuclear power plants, nuclear ships, and nuclear spacecrafts.

- Nuclear engineers use a combination of physics and engineering to develop systems.


Containment Structure
Steam Line
Control Rods
Reactor Vessel
Steam Generator
Generator
Pump
Turbine
Reactor
Cooling Tower
Condensor Cooling Water
Pump



Petroleum Engineering

- Petroleum engineering focus is on the identification, extraction, storage, and transportation of oil and gas.

- Petroleum engineers specialize in oil/gas analysis & estimation and well drilling equipment & operations.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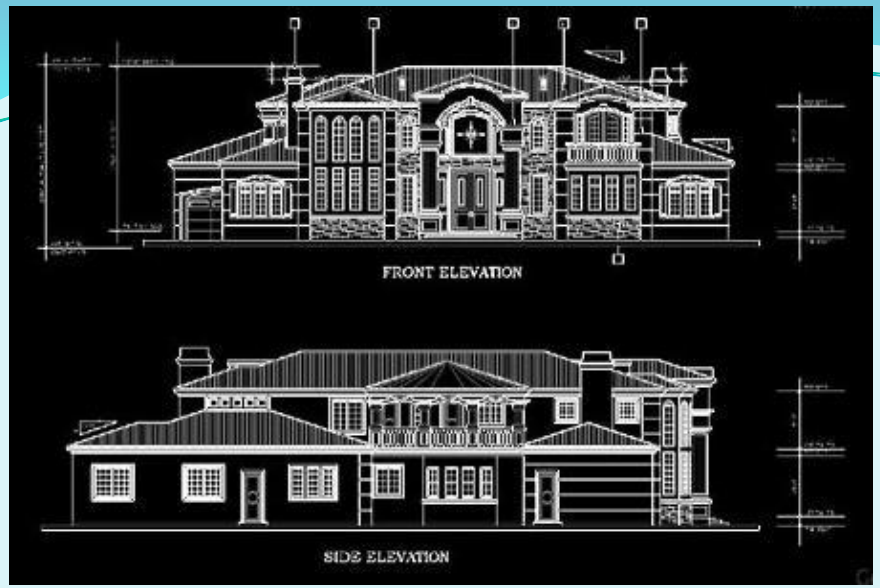
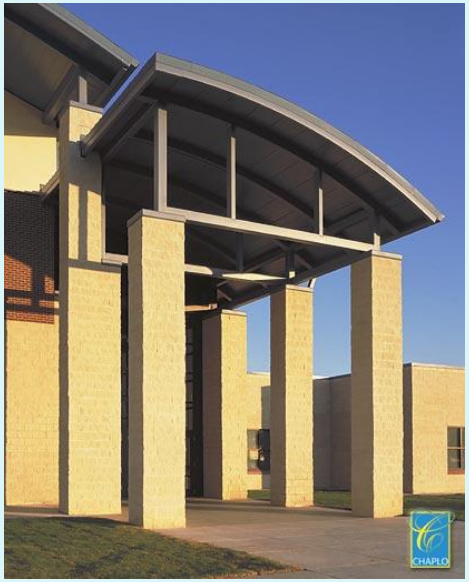
Architectural Engineering

- Architectural engineers combine the knowledge of structures, materials, lightning, acoustics, drawings, and art to design and build commercial and residential structures.

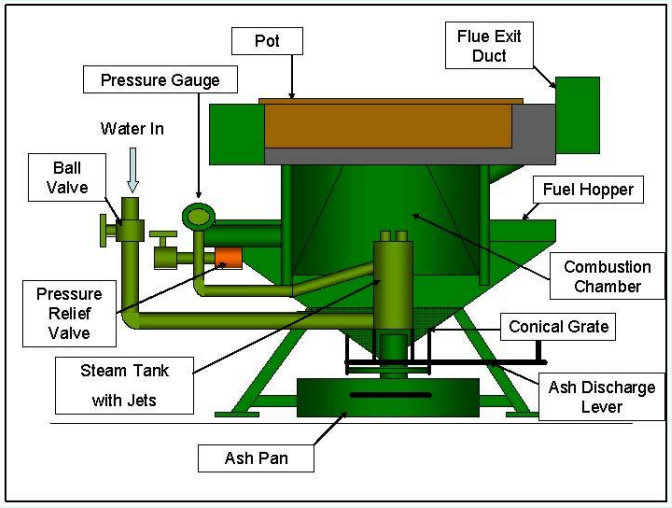
- They specialize in structural systems, mechanical and electrical systems (as related to buildings), and construction management.


FRONT ELEVATION
SIDE ELEVATION



Agricultural Engineering

- Agricultural engineers help farmers to efficiently produce food.
- Agricultural engineers work with the production and processing of agricultural products.
- Agricultural engineers specialize in agriculture equipment & technology, land & water management, and biotechnology.


Pot
Flue Exit Duct
Pressure Gauge
Water In
Ball Valve
Fuel Hopper
Combustion Chamber
Pressure Relief Valve
Conical Grate
Steam Tank with Jets
Ash Discharge Lever
Ash Pan

Conclusions

- Engineering can be divided into several disciplines.
- Those disciplines sometimes overlap.
- The big four are: Civil, Mechanical, Electrical, and Computer