Unit - V

MICRO MECHATRONIC SYSTEM

- MEMS (Micro - Electro - Mechanical Systems) is the integration of mechanical elements, sensors, actuators and electronics on a common substrate through the utilization of microfabrication technology or microtechnology.

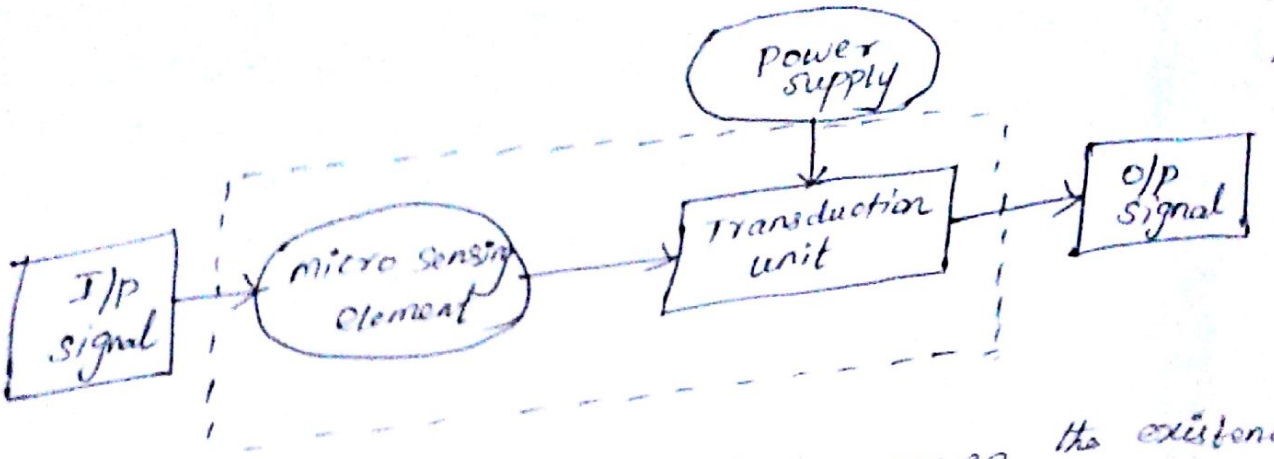
- Egs. of MEMS
  - pressure sensors, accelerometers, flow sensors, inkjet printers, deformable mirror devices, gas sensors, micro motors, microgears, lab-on-a chip systems, etc.

- Advantages of MEMS
  - * Batch fabrication (Reduced cost)
  - * Reduced size
  - * Reduced power
  - * High precision

- A MEMS contains components of sizes in 1 micrometer (um) to 1 millimeter (mm).

- A MEMS is constructed to achieve a certain engineering function (or) functions by electromechanical (or) electrochemical means.

- The core elements of MEMS are
  - * Sensing element
  - * Transduction unit
  - * Actuating element.



- Micro sensors are built to sense the existence and the intensity of certain physical, chemical or biological quantities such as temperature, pressure, force, sound, light etc.,
- Common Sensors include biosensors, chemical sensors, optical sensors, thermal & pressure sensors.

- The transduction unit converts the input power supply into the form such as voltage for a transducer, which function is as the actuating elements.
- The actuator is very important part of a microsystem that involves motion, some actuation motion of micro devices are thermal forces, shape memory alloys, piezo electric crystals & electrostatic force.

- Application of MEMS in Industries:-

→ In Health Care Industry
→ In Industrial products
→ In Consumer products
→ In Tele communications
- In Aerospace Industry

- micro motors
- micro gears
- micro turbines
- micro optical components

Component design

- The modelling and simulation of MEMS can be considered on component or system level.
- it depends on the design and optimisation of micro mechanics.
- also on how a micromechanical component behaves in the context of the system & how the entire system can be designed and optimised.
- The MEMCAD system described by Senturia provides good example for component design.
- In the first stage a so called structure simulator is used in order to depict the descriptions of the mask layout.
- The process sequence provided by the user in the three dimensional geometry of micro mechanics, along with a process history for the selection of the appropriate materials.